

preference to that which had become slacked. It was weighed in a dry state and afterwards wet in the usual manner for firing.

On the morning of the test a new fire was made with wood at about 7:30 a. m. The contents of the fire-box had been dumped in the neighborhood of 7 o'clock on the night before, leaving about 70 lbs. of steam pressure on the boiler. The fire was started on a clean grate and with a clean ash-pan. The pressure of steam had fallen to zero. The height of water in the boiler at the start was noted, a water-glass having been attached to the boiler front for the purpose. The steam blower was employed as usual for urging the fire and raising the desired pressure. The fire was managed on the road in the customary manner, and the same fireman and engineer were employed on all the six tests made on the 11 o'clock train. On the four tests made on the 4:30 train another fireman and engineer were employed. Toward the end of the return trip the fire was allowed to burn out, only a sufficient amount being retained to hold the normal steam pressure till the last stop at the Providence Railroad crossing. On the arrival of the engine at its place in the round-house, the contents of the fire-box were dumped and cooled with water; the injector was started and a sufficient amount of water was fed to the boiler, so that on shrinking with the fall of pressure it should be at the same height on the next morning as that occupied at the time of lighting the fire. The moist coal not used was shoveled off the tender and weighed and a sample taken and dried, so as to determine the amount of correction to be made for the contained water.

The wet cinders and refuse in the ash-pan were also weighed, and a sample of this also dried to determine the correction for moisture. The dry sample was sifted through a screen having $\frac{3}{8}$ in. meshes, and the proportion of unconsumed coke that failed to pass through determined. The weight of dry coal consumed as well as the weight of dry cinders and ashes is corrected for the amount of unconsumed coke thus found.

2. The amount of feed-water supplied to the boiler was determined by measurement in the tender. A glass water-gauge was attached to the outside for convenience in observing the depth of water for this purpose.

The tank was filled at Boston before any feed-water was supplied to the boiler; on arrival of the train at Worcester, again at Springfield, and at Worcester on the return trip. The depth shown on the glass was observed when first filled, as also before and after each subsequent filling, the engine being at rest, and during the process of filling no water was fed to the boiler. The depth of water was observed at all the remaining stations where a stop was made, viz.: at East Brookfield and Palmer on the outward trip, and at Palmer, East Brookfield and South Framingham on the return. These observations have been corrected for the effect produced by the different grades on which the locomotive was situated when they were taken, and for the different heights of water that were shown on the boiler-glass. The number of inches of water fed to the boiler during any particular period of the trips or for the whole round trip can therefore be accurately computed; and the area of the tank (102 sq. ft. in each engine) being known, the corresponding weight

of water can be determined, as has been done in making up the total quantities of the tests. These quantities include the loss of water through the overflow pipe of the injector, which occurred every time the instrument was started, as it does in common use.

3. The indicated power developed in the cylinders was determined by the use of a pair of Tabor indicators, one for each cylinder. The instruments were located at a central point above the steam chest, and a $\frac{3}{4}$ -in. pipe carried by an easy bend from each cylinder head to a $\frac{3}{4} \times \frac{1}{2}$ -in. tee which supported the cock to which the indicator was applied. Straight-way valves were provided in each pipe near the central tee for establishing communication between the indicator and either end of the cylinder at will.

A reducing lever with segment was hung to the under side of the running board, and attached at the lower end by means of a connecting-rod to a stud projecting from the cross-head, for transmitting the reciprocating motion to the indicators. Each cylinder was thus provided.

An operator was stationed at each indicator and a set of diagrams was taken at intervals of $2\frac{1}{2}$ minutes during the whole round trip. The speed in revolutions of the drivers per minute was counted just before taking the diagrams, and the average indications of a steam-gauge showing the pressure in the right-hand steam-chest were also observed. Owing to fluctuations of the pressure in the chest due to the intermittent supply of steam to the cylinder, the valve in the gauge-pipe required to be throttled in order to get sufficiently steady indications to be read. An operator was also stationed in the cab, and at times of taking diagrams he

Specimen Indicator Diagrams.

DIAGRAM NO. 1.	
Locomotive No. 129, July 26.	
Time.....	3.22 1/2 p. m.
Boiler pressure.....	160
Chest pressure.....	153
Rev. per min.....	70
M. E. P. front.....	97.8
M. E. P. crank.....	101.9
Scale.....	80
DIAGRAM NO. 2.	
Locomotive No. 129, July 26.	
Time.....	3.27 1/2 p. m.
Boiler pressure.....	160
Chest pressure.....	148
Rev. per min.....	140
M. E. P. front.....	79.0
M. E. P. crank.....	82.2
Scale.....	80
DIAGRAM NO. 3.	
Locomotive No. 129, July 26.	
Time.....	3.30 p. m.
Boiler pressure.....	160
Chest pressure.....	148
Rev. per min.....	140
M. E. P. front.....	65.9
M. E. P. crank.....	68.8
Scale.....	80
DIAGRAM NO. 4.	
Locomotive No. 129, July 26.	
Time.....	5.37 1/2 p. m.
Boiler pressure.....	160
Chest pressure.....	152
Rev. per min.....	150
M. E. P. front.....	51.1
M. E. P. crank.....	52.4
Scale.....	80
DIAGRAM NO. 5.	
Locomotive No. 129, July 26.	
Time.....	12.05 p. m.
Boiler pressure.....	160
Chest pressure.....	148
Rev. per min.....	208
M. E. P. front.....	54.9
M. E. P. crank.....	55.2
Scale of spring.....	80
DIAGRAM NO. 6.	
Locomotive No. 129, July 26.	
Time.....	12.27 1/2 p. m.
Boiler pressure.....	150 (?)
Chest pressure.....	146
Rev. per min.....	192
M. E. P. front.....	49.9
M. E. P. crank.....	51.1
Scale.....	80
DIAGRAM NO. 7.	
Locomotive No. 129, July 26.	
Time.....	2.31 1/2 p. m.
Boiler pressure.....	155
Chest pressure.....	145
Rev. per min.....	212
M. E. P. front.....	40.3
M. E. P. crank.....	39.8
Scale.....	80
DIAGRAM NO. 8.	
Locomotive No. 129, July 26.	
Time.....	1.15 p. m.
Boiler pressure.....	150 (?)
Chest pressure.....	149 (?)
Rev. per min.....	228
M. E. P. front.....	26.3
M. E. P. crank.....	25.6
Scale.....	80
DIAGRAM NO. 9.	
Locomotive No. 129, July 26.	
Time.....	5.45 p. m.
Boiler pressure.....	155
Chest pressure.....	149
Rev. per min.....	208
M. E. P. front.....	13.7
M. E. P. crank.....	14.9
Scale.....	80
DIAGRAM NO. 10.	
Locomotive No. 169, July 28.	
Time.....	3.27 1/2 p. m.
Boiler pressure.....	155
Chest pressure.....	140
Rev. per min.....	128
M. E. P. front.....	84.8
M. E. P. crank.....	85.7
Scale.....	80
DIAGRAM NO. 11.	
Locomotive No. 169, July 28.	
Time.....	3.30 p. m.

Boiler pressure.....	160
Chest pressure.....	144
Rev. per min.....	140
M. E. P. front.....	70.7
M. E. P. crank.....	70.4
Scale.....	80
DIAGRAM NO. 12.	
Locomotive No. 169, July 28.	
Time.....	12.17 1/2 p. m.
Boiler pressure.....	160
Chest pressure.....	148
Rev. per min.....	180
M. E. P. front.....	49.5
M. E. P. crank.....	45.6
Scale.....	80
DIAGRAM NO. 13.	
Locomotive No. 169, July 28.	
Time.....	5.42 1/2 p. m.
Boiler pressure.....	155
Chest pressure.....	140
Rev. per min.....	216
M. E. P. front.....	47.2
M. E. P. crank.....	45.8
Scale.....	80
DIAGRAM NO. 14.	
Locomotive No. 169, July 28.	
Time.....	11.42 1/2 a. m.
Boiler pressure.....	160
Chest pressure.....	144
Rev. per min.....	218
M. E. P. front.....	39.2
M. E. P. crank.....	37.4
Scale.....	80
DIAGRAM NO. 15.	
Locomotive No. 169, July 28.	
Time.....	11.15 a. m.
Boiler pressure.....	160
Chest pressure.....	142
Rev. per min.....	192
M. E. P. front.....	32.6
M. E. P. crank.....	32.4
Scale.....	80
DIAGRAM NO. 16.	
Locomotive No. 169, July 28.	
Time.....	5.22 1/2 p. m.
Boiler pressure.....	160
Chest pressure.....	150
Rev. per min.....	206
M. E. P. front.....	25.1
M. E. P. crank.....	23.9
Scale.....	80
DIAGRAM NO. 17.	
Locomotive No. 169, July 28.	
Time.....	5.15 p. m.
Boiler pressure.....	160
Chest pressure.....	147
Rev. per min.....	228
M. E. P. front.....	10.9
M. E. P. crank.....	8.2
Scale.....	80
DIAGRAM NO. 18.	
Locomotive No. 150, July 20.	
Time.....	3.27 1/2 p. m.
Boiler pressure.....	130
Chest pressure.....	128
Rev. per min.....	138
M. E. P. front.....	75.2
M. E. P. crank.....	73.6
DIAGRAM NO. 19.	
Locomotive No. 150, July 20.	
Time.....	3.30 p. m.
Boiler pressure.....	128
Chest pressure.....	120
Rev. per min.....	138
M. E. P. front.....	67.9
M. E. P. crank.....	62.0
Scale.....	80
DIAGRAM NO. 20.	
Locomotive No. 150, July 20.	
Time.....	11.36 a. m.
Boiler pressure.....	130
Chest pressure.....	125
Rev. per min.....	135
M. E. P. front.....	57.9
M. E. P. crank.....	45.1
Scale.....	80
DIAGRAM NO. 21.	
Locomotive No. 150, July 20.	
Time.....	11.20 a. m.
Boiler pressure.....	130
Chest pressure.....	120
Rev. per min.....	216

M. E. P. front.....	45.1
M. E. P. crank.....	39.3
Scale.....	80
DIAGRAM NO. 22.	
Locomotive No. 150, July 20.	
Time.....	5.55 p. m.
Boiler pressure.....	125
Chest pressure.....	120
Rev. per min.....	220
M. E. P. front.....	31.5
M. E. P. crank.....	14.6
Scale.....	80
DIAGRAM NO. 23.	
Locomotive No. 150, July 20.	
Time.....	5.10 p. m.
Boiler pressure.....	130
Chest pressure.....	122
Rev. per min.....	224
M. E. P. front.....	23.7
M. E. P. crank.....	2.7
DIAGRAM NO. 24.	
Locomotive No. 150, July 21.	
Time.....	4.32 1/2 p. m.
Boiler pressure.....	125
Chest pressure.....	115
Rev. per min.....	128
M. E. P. front.....	74.1
M. E. P. crank.....	74.1
Scale.....	80
DIAGRAM NO. 25.	
Locomotive No. 150, July 21.	
Time.....	4.30 p. m.
Boiler pressure.....	130
Chest pressure.....	117
Rev. per min.....	140
M. E. P. front.....	65.0
M. E. P. crank.....	62.7
Scale.....	80
DIAGRAM NO. 26.	
Locomotive No. 150, July 21.	
Time.....	12.37 1/2 p. m.
Boiler pressure.....	130
Chest pressure.....	119
Rev. per min.....	136
M. E. P. front.....	55.2
M. E. P. crank.....	53.8
Scale.....	80
DIAGRAM NO. 27.	
Locomotive No. 150, July 21.	
Time.....	11.52 1/2 a. m.
Boiler pressure.....	130
Chest pressure.....	121
Rev. per min.....	168
M. E. P. front.....	37.4
M. E. P. crank.....	25.3
Scale.....	80
DIAGRAM NO. 28.	
Locomotive No. 150, July 21.	
Time.....	12.05 p. m.
Boiler pressure.....	130
Chest pressure.....	115
Rev. per min.....	230
M. E. P. front.....	53.0
M. E. P. crank.....	48.3
Scale.....	80
DIAGRAM NO. 29.	
Locomotive No. 150, July 21.	
Time.....	11.20 a. m.
Boiler pressure.....	130
Chest pressure.....	117
Rev. per min.....	192
M. E. P. front.....	46.7
M. E. P. crank.....	41.3
Scale.....	80
DIAGRAM NO. 30.	
Locomotive No. 150, July 21.	
Time.....	11.10 a. m.
Boiler pressure.....	130
Chest pressure.....	121
Rev. per min.....	210
M. E. P. front.....	34.6
M. E. P. crank.....	27.4
Scale.....	80
DIAGRAM NO. 31.	
Locomotive No. 150, July 21.	
Time.....	11.30 a. m.
Boiler pressure.....	130
Chest pressure.....	120
Rev. per min.....	220
M. E. P. front.....	20.1
M. E. P. crank.....	15.0
Scale.....	80

observed the pressure in the boiler shown by the cab gauge, and the position of the reversing lever. The employment of a set screw made the lever adjustable between adjacent notches. The throttle was kept wide open, when opened at all, and regulation effected by adjusting the position of the reversing lever. On down grades, where the attainment of a proper speed did not prevent, the throttle was entirely closed after the usual practice. At these times intervals occurred in the taking of diagrams, and the time that elapsed while the steam was shut off was carefully noted.

During the progress of the tests steam was employed in the usual manner for blowing the whistle, and steam was occasionally wasted at the safety valve by over-pressure.

The temperature and vacuum in the smoke arch were not observed.

The duration of the tests as they pertain to the evaporative performance of the boilers has been arbitrarily assumed to be 4.17 hours for those made on the 4.30 p. m. train and 4.50 hours for the remaining ones. Deducting for the time of stops and shutting off on down grades, the throttle was open and the boilers in normal action about 3 hours 40 minutes on the first tests and 4 hours on the second; and to these times have been added 30 minutes to obtain the durations given.

On the tests which give the detailed performance in the cylinders the duration is the length of time that the throttle was open.

Engines No. 129 and No. 169 were tested for leakage of valves and pistons under 125 lbs. pressure, and No. 150 under 95 lbs. pressure. They were all found practically tight.

THE DATA AND RESULTS

Of the tests are given in the following tables, of which table No. 2 contains the data and results pertaining to the evaporation performance of the boilers on all the tests. It also gives the average indicated horse-power on the round trip for three days on which it has been computed.

Table No. 3 contains the data and results in detail of the performance in the cylinders of the three engines. This applies to only three days of the tests and to that part of the route that lies between Springfield and East Brookfield on the return trips. This selection has been made for the comparison of the engines for the reason that the weight of the train, the speed and the amount of power developed, were nearly the same in all.

Appended are copies of specimen indicator diagrams taken from the right-hand cylinder. A set is given for each en-

gine taken with the reversing lever in various notches, both with slow and medium speeds. A set is given for each day's test of No. 150. After the first test of No. 150 the valve-stems on each side were lengthened about $\frac{1}{4}$ of an inch. They had previously been "set by sound," as it is called.

REVIEW OF THE RESULTS.

The Relative Performance of the Boilers.—It will be seen from the table of boiler performance that the boiler of No. 150 on the tests of July 20 and 21 gave a higher evaporation per pound of fuel than that of No. 129 on the tests of July 11 and 12 with what was supposed to be the same kind of coal. The rate of combustion was about the same in both, but the rate of evaporation per square foot of heating surface was much larger in No. 150 than in No. 129. This should have made No. 150 less economical than No. 129. Some other condition, it would appear, varied enough to produce an overpowering effect and produce an opposite result. There is a marked difference in the proportion of ashes in the two cases. The reduced amount on the test of No. 150 points to a better quality in the coal used on that engine. In the matter of quality there appears to be a considerable variation even in coal which came from the same mine. There is a strong indication of this in the results of the tests of July 13 and 14 on No. 169, which showed a large difference in the consumption of coal with but little corresponding difference in the consumption of feed-water.

If the proportion of ashes be taken as indicating the quality of the fuel, it appears that the coal used on the last six tests was of uniform quality, the percentages of ash being nearly the same in all, and the results of these tests on evaporation may fairly be compared.

The average evaporation of No. 150 per pound of fuel was 5.75, and that of No. 129, on the tests of July 25 and 26, 6.55 lbs., which shows a gain in the case of No. 129 of 0.80 lbs. or 14 per cent.

The Relative Performance of the Valves in Nos. 129 and 169.—The Allen valve is designed to secure a larger area for the admission of steam to the cylinder, thereby to reduce the amount of wire-drawing. There are three ways in which the beneficial effect that it produces should be revealed: First, in the form of the indicator diagram; second, in the reduction of the consumption of steam computed from the diagram; and, third, in the reduction of the amount of feed-water consumed per indicated horse-power per hour.

(1). Referring to the copies of indicator diagrams given in the report a close observation shows that those taken from

No. 169 with the Allen valve are in a slight degree fuller during admission than those taken from No. 129.

Referring to Table No. 3, giving the detailed performance in the cylinders, it appears that with the same pressure in the boiler in both, there was in No. 169 1.6 lbs. greater initial pressure, 2.1 lbs. greater normal initial pressure, and 5.7 lbs. greater pressure at the point of cut-off, than in No. 129. The increased pressure averages 3.6 lbs. up to the cut-off, which is equivalent to an average effective increase on the whole stroke of 1.15 lbs. If there was no other difference in the operation of the steam in the cylinder, such an increase in the mean effective pressure should be obtained without any practical increase in the consumption of steam. In other words, $\frac{1.15}{53.86} = 2$ per cent. more power would be produced with the same consumption, or about 2 per cent. less consumption with the same development of power.

(2). The amount of steam computed from the diagrams at cut-off on the tests of No. 129 and 169 is respectively 19.63 and 19.39. Here is a reduction of 0.24 lbs. or 1.2 per cent. in favor of No. 169. The release indicates a greater consumption in No. 169 than in No. 129; but for purposes of comparison the quantities at cut-off give the more reliable indication of the economy. It should be noted that the consumption figured from the diagram takes into account the effect of all the variable conditions in the distribution of the steam that act in the cylinder. Not only is the effect of differences in the amount of wire-drawing, which specially concern the subject in hand, accounted for, but differences also in the amount of back pressure, in the time of release and compression and in the manner of admission and expansion. In No. 169 there is later release and earlier compression, both of which are favorable to economy, but the difference here is slight and exerts comparatively little effect. There is a considerably higher back-pressure in No. 169, and this is unfavorable to economy. Its effect is to reduce the mean effective pressure about one pound per square inch, equivalent to raising the consumption by diagram 1.9 per cent. Allowing half of 1 per cent. the effect of the difference in the release and compression, the whole difference in favor of the Allen valve shown by diagram consumption, other conditions being the same, is 2.6 per cent.

(3). The consumption of feed-water per indicated horse-power per hour was 25.65 lbs. in No. 129 and 24.51 lbs. in No. 169. Here is a reduction of 1.14 lbs., or 4.5 per cent.

Table No. 2.—Data and Results of the Evaporative Performance.

DATE OF TEST, 1882.	NAME OF LOCOMOTIVE.									
	No. 129.		No. 169.		No. 150.		No. 129.		No. 169.	
	July 11.	July 12.	July 13.	July 14.	July 20.	July 21.	July 25.	July 26.	July 28.	July 29.
1. Duration of test.....hrs.	4.17	4.17	4.17	4.17	4.50	4.50	4.50	4.50	4.50	4.50
2. Weight of wood for lighting fire.....lbs.	420	420	387	415	350	350	350	350	350	350
3. Equivalent value of wood = wt. × 4.10.....	168	168	155	166	140	140	140	140	140	140
4. Weight of coal fired.....	8,707	8,770	8,284	7,504	9,200	8,174	7,377	7,033	7,214	6,656
5. Unconsumed coke in cinders and refuse.....	60	64	56	43	40	42	94	47	50	38
6. Weight of coal consumed.....	8,647	8,706	8,228	7,551	9,220	8,132	7,283	6,986	7,164	6,618
7. Weight of fuel consumed (includes wood).....	8,615	8,674	8,383	7,717	9,300	8,372	7,423	7,123	7,304	6,758
8. Wt. of fuel consumed per hour.....	2,114	2,128	2,010	1,851	2,080	1,838	1,650	1,584	1,623	1,502
9. Wt. of fuel per hour per sq. ft. grate.....	121.5	122.2	115.5	106.4	130.0	114.9	94.8	91.0	93.3	86.3
10. Wt. of cinders and ashes.....	505	502	406	354	536	269	264	272	202	202
11. Percentage of cinders and ash to total consumption.....	5.7	5.7	6.0	5.3	3.8	4.1	3.6	3.7	3.7	3.0
12. Weight of combustible consumed.....	8,369	8,369	7,881	7,311	9,006	7,936	7,154	6,862	7,032	6,555
13. Number of inches of water fed.....in.	90.4	92.9	93.3	90.8	99.9	91.7	90.1	90.2	91.5	90.0
14. Number of pounds of water fed.....lbs.	47,805	49,127	49,322	48,001	52,817	48,482	47,636	47,689	48,376	47,583
15. Number of pounds fed per hour.....	11,464	11,781	11,828	11,511	11,737	10,774	10,586	10,598	10,750	10,574
16. Wt. fed per hour per sq. ft. heating surface.....	9.21	9.46	9.50	9.25	11.80	10.65	8.50	8.51	8.63	8.49
17. Horse power on basis of 30 lbs. fed per H. P. per hour.....	382.1	392.7	394.3	393.7	359.1	352.9	353.3	353.3	358.3	352.5
18. Average boiler pressure.....	155	155	155	155	120	129	154	155	156	157
19. Approximate temperature of feed-water.....°	72	72	72	72	72	72	72	72	72	72
20. Water evaporated* per pound of fuel.....lbs.	5.42	5.54	5.88	6.22	5.64	5.86	6.42	6.69	6.62	7.04
21. Water evaporated* per pound of combustible.....	6.17	6.30	6.69	7.08	6.42	6.67	7.31	7.61	7.53	8.01
22. Equivalent evaporation per lb. fuel with feed 212°.....	6.17	6.30	6.69	7.08	6.42	6.67	7.31	7.61	7.53	8.01
23. Equiv. Evap'n per lb. combustible from and at 212°.....	7.01	7.01	7.48	7.85	6.97	7.25	7.92	8.27	8.17	8.64
24. Average indicated horse power.....					428.4					430.4
25. Cars hauled from Boston to Springfield.....					6 N. Y.	6 B. & A.	6 N. Y.	6 B. & A.	6 B. & A.	6 N. Y.
26. Cars hauled from Springfield to Boston.....					7 B. & A.	7 N. Y.	7 B. & A.	7 N. Y.	7 N. Y.	7 B. & A.
27. Time of leaving Boston.....	4.30 p. m.	4.30 p. m.	4.30 p. m.	4.30 p. m.	11.00 a. m.	11.00 a. m.	11.00 a. m.	11.00 a. m.	11.00 a. m.	11.00 a. m.

* This in reality is water fed. Except for the waste by the injector overflow it is actual evaporation.
 † The term "Fram." refers to cars taken on at So. Framingham.

in favor of No. 169. As the consumption by diagram in the two cases differs but 1.2 per cent., there should not be a greater difference in the consumption of feed-water, unless produced by leakage of the valves and pistons. There may have been, however, a difference in the amount of water lost by the injector overflow or in the amount of steam wasted by blowing off. There is a chance for a small error in the observation of the depth of water in the tender, on which the amount of feed-water consumption depends. These all acting, if only in a slight degree, might be sufficient to produce the relatively large difference in the consumption of feed-water.

From these considerations, it appears to the writer, that the actual economy between the two engines produced by the Allen valve amounts to about 2 per cent.

It is to be noted that in the case of the engine having the Allen valve, the travel was less and the opening of the steam-port to the cylinder was greater than in that with the common valve. These conditions doubtless modified the effect that might otherwise have been produced.

3. The relative performance of the two engines at the pressures 160 lbs. and 130 lbs.—The consumption of steam by diagram at cut-off per indicated horse-power per hour was in No. 150 22.71 lbs. and in No. 129 19.63 lbs. Here is a reduction of 3.08 lbs., or 13.67 per cent., in favor of No. 129 and the higher boiler pressure.

The feed-water consumed per indicated horse-power per hour was, in No. 150, 27.00 lbs. and in No. 129, 25.65 lbs. That of 129 is 1.35 lbs. or 5 per cent. less than that of 150. This difference is much less than the consumption by diagram shows, and for the reasons already referred to it may be somewhat erroneous. The difference here ought, however, to be in a measure less, because there was less expansion in No. 150 than in No. 129, and consequently a less amount of loss by cylinder condensation, which is not taken account of by the diagram. Whatever leakage of steam acted would also produce a smaller amount of loss in No. 150 than in No. 129, on account of the reduced pressure. Under all the circumstances 7.5 per cent. appears to be a fair allowance for the difference in the actual consumption of steam produced by the higher boiler pressure.

Taking the consumption of feed-water per indicated horse-power per hour in No. 150 at 27.00 lbs. and the evaporation per pound of fuel 5.75 lbs., the consumption of fuel per indicated horse-power per hour is 4.70 lbs. Taking the consumption of feed-water in No. 129 at 25.00 lbs. and the evaporation per pound of fuel 6.55 lbs., the consumption of fuel per indicated horse-power per hour is 3.93 lbs. The net economy of No. 129 over No. 150 is therefore 0.78 lbs. or 16% per cent.

The performance of No. 169 based on the highest evaporation is $\frac{24.51}{7.04} = 3.50$ lbs. of fuel per indicated horse-power per hour.

Ready Mixed or Prepared Ground Colors in Railway Paint Shops.

[Paper read by Mr. John H. Will, Master Car Painter of the New York Central & Hudson River Railroad, at the 13th annual meeting of the Master Car Painters' Association.]

In common with most painters who have served a regular apprenticeship, I have always and still entertain prejudices against the mass of ready mixed colors and paints turned out by grinders and manufacturers. When I learned my trade we were entirely dependent upon our own shop mixtures, and, to a considerable extent, for the grinding of our colors and paints. It is not to be denied, however, that by the aid of improved mills run by steam power manufacturers have been able to produce pigments, colors and paints far superior to those mixed and ground by hand in the shops. Yet my experience in the use of prepared and ready mixed colors is not extensive, and I have not wholly overcome my prejudices and objections to them. My objections to them are that we cannot safely rely upon their quality, or even the honesty with which they are compounded, there are so many different substances that are called by the same name. We can find ochres, for instance, in the market which have little if any of the natural pigment in them; many of them are artificial products. The same with umbers, with carmines, with vermilion; in fact, with nearly all of our colors and pigments that it will pay to imitate. And manufacturers are tempted, driven, it may be by competition, to mix their ready-prepared paints with these cheapened imitations. It may be suggested, in reply to these objections, that we should be subject to the same imposition in supplying material for our own mixing; but it is much easier to detect adulterations and imitations in the crude material than in the mixed paint or color.

My own objections are not based on any considerations of professional jealousy. If prepared paints can be furnished to us in better condition for use and cheaper than we can produce them I do not apprehend that our occupation will be belittled or interfered with. We shall still have enough of intricacies and practical questions to determine, and our

Table No. 3.—Data and Results of the Performance in the Cylinders.

Date of Test.....	NAME OF ENGINE.		
	No. 129.	No. 169.	No. 150.
	July 26.	July 28.	July 21.
1. Portion of the route.....	Spr. to E. Br.	Spr. to E. Br.	Spr. to E. Br.
2. Duration of the test.....hrs.	0.842	0.867	0.871
3. Number of inches of feed-water consumed.....in.	23.34	23.04	24.44
4. Number of pounds of feed-water consumed.....lbs.	12,340	12,181	12,921
5. Consumption of feed-water per hour.....	14,632	14,050	14,829
6. Average boiler pressure.....	156	156	129
7. Average pressure in right-hand chest.....	146	144	119
8. Average initial pressure in cylinder above atmosphere.....	150.0	151.0	120.0
9. Average normal initial pressure in cylinder above atmosphere.....	131.0	133.1	107.5
10. Average pressure at cut-off above atmosphere.....	98.2	103.9	80.4
11. Average pressure at cut-off above zero.....	112.9	118.6	95.1
12. Pressure at release measured on a hyperbolic curve passing through point of cut-off.....	54.5	54.7	49.3
13. Average pressure at compression point above zero.....	29.6	31.3	30.1
14. Average back pressure at lowest point above atmosphere.....	5.5	6.9	7.4
15. Proportion of direct stroke completed at cut-off.....	0.329	0.317	0.416
16. Actual cut-off (clearance 7 p. c.).....	0.373	0.362	0.454
17. Proportion of direct stroke completed at release.....	0.756	0.771	0.807
18. Proportion of return stroke uncompleted at compression.....	0.276	0.303	0.221
19. Average mean effective pressure.....	54.43	53.86	51.58
20. Average speed in revolutions per minute.....	189.3	190.0	190.0
21. Average indicated horse-power.....H. P.	570.5	573.2	549.5
22. Consumption of feed-water per I. H. P. per hour.....lbs.	25.65	24.51	27.00
23. Steam act. for by diagram at cut-off per I. H. P. per hour.....	19.63	19.39	22.71
24. Steam act. for by diagram at release per I. H. P. per hour.....	20.30	20.59	23.27
25. Proportion of feed act. for by diagram at cut-off.....	0.765	0.791	0.841
26. Proportion of feed act. for by diagram at release.....	0.791	0.840	0.861
27. Cars.....	7 N. Y.	7 N. Y.	7 N. Y.

NOTE.—The points where the various pressures given above are measured are represented upon diagram No. 5.

technical knowledge of the nature and mixing qualities of paints and colors will not be in less requisition when they shall be furnished to our hand ready for use.

In the first place, assuming that we can surely rely upon the skill and honesty of mixers and grinders, it can not be denied, as I have intimated, that large manufacturers can better secure uniformity of quality and color. We must assume that if the manufacturer is paid a fair profit for his risk, he will prefer to turn out good and reliable paint. To do this, he will secure the services of experts, and, above all, one who has had experience in the use and application of paints—in other words, a good painter, to direct the selection and mixing of the pigments and vehicles of the paints he shall compound. They will be able to secure the services of men versed in the chemical relations of the colors he mixes to produce a given tint of shade, and having at their command a large stock and variety of material, they will always secure a uniform result, both as to quality and tone of color. Besides, a railroad like the New York Central & Hudson River, whose extent necessitates a large number of shops scattered along the whole route, having selected a tint for body color, will be able to turn out all their cars of a uniform tint. Then a car can be run into any shop along the whole line for repairs with a certainty of being intelligently handled by the master painter of that shop, though he did not paint it in the first instance. He has at hand a paint mixed after the same formula and subject to the same treatment, and can patch or repaint without accident to matching and without the risk of making a mistake, either in respect to quality or tint.

My second point is, that the greatest degree of durability in paints may in this way be secured. We all know that the permanence of colors in secondary or mixed paints depends in the first instance on the chemical relations of the colors and pigments employed in producing the desired tint of color. These secondary or mixed colors may be produced by various combinations. I mean to say that the same tint may be made by different mixtures. Our rule in mixing is, of course, to use the least number of colors possible to secure the desired tint or color; also the chemical relations of the ingredients must be kept in mind.

I have no doubt that the quick fading or changing of many colors is due to the fact that unfavorable effects are produced by the chemical changes which take place between colors after they are applied. We know, for instance, that vermilion is affected by contact with iron or lead in any form, whether by the mill in which it is ground, or any paint with which it may be mixed or applied. I do not mean to say that we could not in our shops compound and mix in a small way just as durable paint as any manufacturer can, provided we have the same choice of materials and colors. Although it is not to be expected that we shall be chemical experts, yet if we have at hand the necessary choice of material, we ought to know how to make as good, if not the best and most durable combinations. But the day of the slab and muller has gone by, nor can we rely

even upon hand mills to grind and mix colors for a large railroad or car shop.

Is it strange, then, with the increased and increasing number of pigments in use, that we should avail ourselves of the improved facilities and expert knowledge available in a large concern for the combination and mixing of colors and paints? The fact that we cannot always rely upon the prepared colors and paints that are recommended to us, does not affect my argument, for I am supposing that the paints shall be mixed and prepared under the direction of competent experts, and that the whole shall be done honestly, and with a view to produce the very best results. Nor is a competent and reliable manufacturer a merely supposititious case. In our shops we use the ground colors and prepared paints of a house in the city of New York. No secret is made of the formula upon which they are mixed, and I should not have the slightest hesitation in relying upon their skill and honesty. There are, no doubt, houses just as reliable scattered all over the country, whose interest it would be to make their supplies just what are needed for good and economical work.

This brings me to another benefit which would result from the use of ready-prepared colors, and that is the question of economy. It needs no argument to show that, if we can be sure of the quality of paints furnished us, they can be produced on a large scale, and with the facilities of a large factory, cheaper than we can grind and mix them in our shops. I believe that the best paint is the most economical; and I am supposing that we can, through manufacturers, secure the very best through the use of the very best material, skillfully and honestly manufactured. The physician knows how to mix and compound medicines, but he relies upon those who make it their special business to do this mixing and compounding. He gets better prepared medicines and extracts with a saving in expense. Carriage painters in both large and small factories, with few exceptions, use prepared coach colors, and their superiority both in respect to quality and economy are now very generally acknowledged. So in many railroad shops, the mass of paints used are furnished ready prepared. As I have said, the fact that these paints are faulty, because prepared by those who did not avail themselves of the best practical skill, or were dishonest in their preparation, has nothing to do with the question.

If, then, we can hold any responsible party accountable for the quality of the paints he shall furnish to the shops, I claim that we are in the way of placing responsibility for any bad work which comes from the paint shop. As it is now, the painter is held accountable for bad work which may result from the use of poor material.

When the painter or manufacturer selects his own materials he becomes responsible for the result of his combinations and the quality of his product. Under the system now generally in vogue, the painter is called upon to handle and combine materials bought by another. A job of work

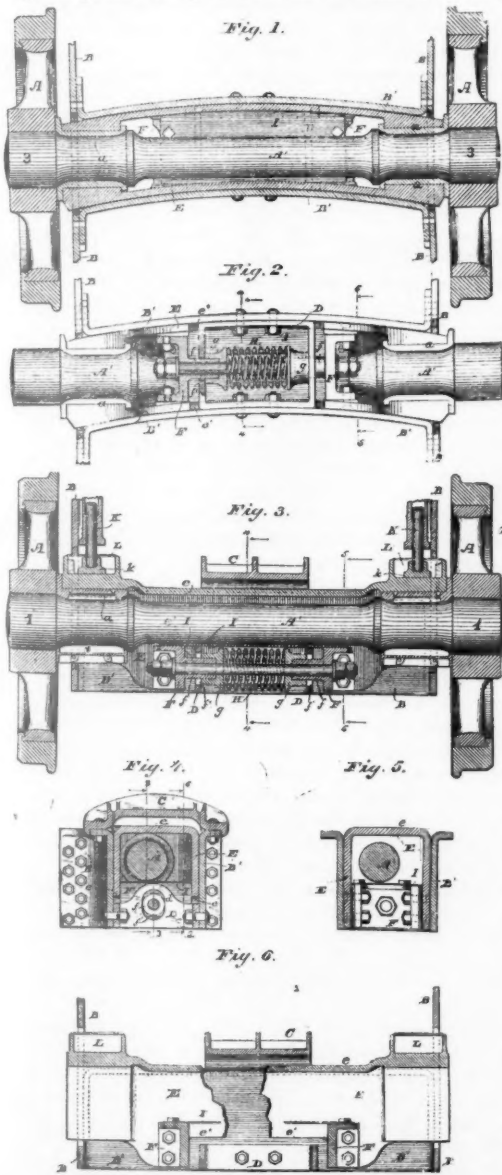
is to be done; it may be the painting of a depot, or the finishing of a lot of passenger coaches. A requisition is made for so much lead, oil, colors, and the other material as are supposed necessary to do the work, and they are selected by some one who perhaps knows little or nothing of the technical properties and special qualities of the articles required. A watchful superior officer discerns that the new cars soon become dingy, and infers correctly that there is something wrong. He notifies an officer in charge, and the master car-builder is instructed to inquire into the matter. The master painter is held accountable, but he insists, and rightly, that he did the very best possible with the material furnished; and it is readily seen that the fault may be in the material, for the quality and working properties of which he is not accountable. If further investigation is made, it will be found that the responsibility will be hustled about from the paint shop to the paint-supply dealer, and it will in all probability be left vacillating between the paint man and the purchasing agent. Very likely, too, the varnish will come in for its share of the condemnation.

Now, if a responsible party, like a large manufacturer, could be held accountable for the quality of the material, as well as for the skill and honesty of the making, we should, I think, be in the way of fixing the responsibility for bad work from the paint shop where it belongs. We must expect to be held responsible for any failure on our part, through want of skill and ability, to do the work we attempt; nor could we complain if we were held responsible for the working qualities of material which we selected and approved; but since this is out of the question, then I think the accountability of a responsible and honest maker of ready-prepared ground colors and paints would relieve the paint shop from many unjust aspersions, and at the same time secure to our employers uniformity of results and durability of work in the paint shop, with the greatest economy and with a fixed responsibility.

Webb's Improved Axle-Box or Radial Truck.

Mr. F. W. Webb, the well-known mechanical engineer of the London & Northwestern Railway, has recently taken out a patent in this country for an improvement in single axle trucks for locomotives. The following engravings and description are taken from the patent specification:

The object of the invention is to permit a lateral motion of the axle of a locomotive or other vehicle and a corresponding lateral swing of the frame to facilitate working



Webb's Improved Axle-Box, or Radial Truck.

around curves in the track. When a locomotive or other vehicle is entering a curve the first effect, as is well understood, will be for the axle to tend to move laterally to accommodate the change in direction, and upon leaving the curve the locomotive-frame will tend to move on the axle-box to accommodate the change in motion. The axle and frame in their lateral movements in either direction operate to compress a nest of springs placed in the axle-box midway, or thereabout, between the wheels, and these springs impart a tension and elasticity to the parts and tend always to return them to their normal central position. I employ a nest of springs, so that in case of breakage of one of them there will still be another or others to receive the thrust of the lateral movements. Under the organization of my invention

above indicated engines can work around curves without any shock, jar, or strain upon the frame or running-gear.

I will now describe my improvements in detail, referring to the accompanying drawings, in which:

Figure 1 is a horizontal sectional view on the line 1 1 of fig. 3, looking in the direction of the arrows. Fig. 2 is a plain view, partly in section, looking at the under side of my improved axle-box. Fig. 3 is a vertical section on the line 3 3 of figs. 1 and 4, looking in the direction of the arrows. Fig. 4 is a transverse section on the line 4 4 of figs. 2 and 3, looking in the direction of the arrows; fig. 5 a transverse section on the line 5 5 of figs. 2 and 3, looking in the direction of the arrows; and fig. 6 is a longitudinal sectional detail view on the line 6 6 of fig. 4, looking in the direction of the arrows.

My improvements are designed to be applied to the front or hind or trailing carrying-wheels of a locomotive or other vehicle. In the drawings they are shown applied to the front wheels of a locomotive, and the lateral motion of the axle-box is in the curved path, of which the centre is at a point in rear of the axle and about in the centre of the usual group of four or more main carrying wheels. Of course the arc of motion may be described from any suitable point.

The wheels *A* are mounted upon the axle *A'* in any usual and ordinary manner. The frame of the locomotive (represented by the letter *B*) is rigidly bolted to the front and rear plates or walls *B B'* of the outer boxing or guide. These walls are united centrally across the top by a straddling arch or bridge *C*, which is firmly bolted to each wall, and gives the necessary strength and rigidity to the parts. As shown in the drawings, the skeleton axle-boxing formed by the walls or plates *B B'* and the bridge *C* is open at the top and bottom, and in horizontal section shows a curved shape, the centres from which the similar arcs or lines of the walls are struck being in rear of the axle, as above mentioned. This boxing or guide, which is rigid with the locomotive frame, is to receive a correspondingly-shaped axle-box, which moves laterally therein, and on which the frame and skeleton boxing *B* in turn swing laterally, as will be hereinafter described. Midway between the wheels a spring-frame *D* is rigidly bolted to the front and rear plates *B B'* of the outer box, near their lower edges. The ends of this frame are preferably curved or arched, as shown at *d*, fig. 4.

The axle *A'* has its bearing in suitable journals *a a*, which are carried in the laterally-moving internal boxing *E*, which fits snugly in the boxing *B B'*, as clearly illustrated. This internal boxing *E* is preferably cast, and is rectangular in general cross-section, as illustrated in figs. 4 and 5. It is open at the bottom, but closed at the top, its upper solid face *e* being preferably formed in one piece with the side plates or sections. Its side walls are, however, cut out at *e'*, so as to straddle the spring-frame *D* and permit the necessary lateral motion of the parts without coming in contact with it. This construction is clearly illustrated in the bottom view, fig. 2, and in figs. 4 and 6.

Two cross-heads *F F* are rigidly bolted to the laterally-moving internal boxing *E* opposite each end of the spring-frame *D*. (See figs. 2, 3, and 6.) These cross-heads are provided with bosses or hubs *f f*, which project through the elongated openings *f' f'* in each end of the spring-frame and bear against internal annular shoulders on washers or socketed thrust-heads *g*.

The nest of springs *H* (two coiled springs being shown) is placed between the ends of the heads *g g*, and the springs and washers are held in place by a rod or bolt which passes through them and the cross-heads *F*, and is secured by suitable nuts. It will be noted that the axle *A'* passes through the upper portion of the axle-box, and that the springs, cross-heads, etc., are placed below the axle, a plate, *I*, being placed between them and bolted to the cross-heads as a guard for dirt, etc.

The frame of the locomotive, as above described, is securely bolted to the outer boxing or guides *B B'*. It is also supported upon the top of the internal box *E*, at each end by strut-rods *K*, having bearing-shoes *k*, which bear and work in the sockets or grease-boxes *L* on the ends of the box, as shown clearly in fig. 3.

Under the above organization it will be obvious that when a locomotive strikes a curve in the track the axle will be thrown laterally to accommodate the change in direction. The internal boxing *E*, which carries the axle, will therefore slide laterally within the outer boxing *B*. One of the bosses *f* on the cross-heads *F*, according as the axle is thrown to the right or left, will compress the nest of springs within the spring-frame *D*, which is rigidly secured to the boxing *B*. In this movement the bearing-shoes *k* on the frame-struts *K* will slide in the sockets *L* on the frame.

It will be obvious that the frame may also swing laterally independently of the axle and its boxing *E*. In the latter case the outer boxing *B* will slide on the inner boxing, and the shoes on the frame-struts will slide in their sockets to accommodate the movement.

Under my improved construction the locomotive possesses an elasticity and flexibility which greatly facilitate its working around curves and prevent shocks and jars to the engine and running-gear.

The details of my organization may be varied by those skilled in the art without departing from the principle of my invention. Thus the springs might be carried by the laterally-moving axle-box, and the thrust bosses or heads might be secured upon the outer boxing or frame *B*. Such modifications of structure will readily present themselves, and do not involve substantial departures from my construction.

The fact that the axle-box moves laterally in the curved path described enables the wheels to follow the curvature of the track with greater ease and with less liability to strain.

THE SCRAP HEAP.

Locomotive Building.

The Cooke Locomotive Works, in Paterson, N. J., in October shipped 13 engines for the Delaware, Lackawanna & Western, the Union Pacific and other roads.

The New York, Pennsylvania & Ohio shops at Meadville, Pa., are building several new tank engines for shifting purposes. The first one has been completed and is in the Salamanca yard.

The Grant Locomotive Works, in Paterson, N. J., last month shipped 13 engines for the Texas & St. Louis and some other roads.

The Schenectady Locomotive Works, in Schenectady, N. Y., are to build 13 locomotives for the Canada Southern road.

The Rogers Locomotive Works, in Paterson, N. J., shipped in October 23 engines, including locomotives for the Canadian Pacific, the Texas & Pacific, the Missouri Pacific, the Louisville, New Albany & Chicago, the Louisville & Nashville, the East Tennessee, Virginia & Georgia and the New York, West Shore & Buffalo roads.

The Pittsburgh, Ft. Wayne & Chicago shops in Allegheny, Pa., are building several new locomotives for the road.

Car Notes.

The New York, New Haven & Hartford shops in New Haven, Conn., have just turned out a complete train, consisting of baggage car, smoking car, two passenger cars and

two parlor cars. The train is to run on the fast line between New York and Boston.

The Northern Pacific shops at New Tacoma, Wash. Ter., are building a large number of freight cars for the road.

The Wason Manufacturing Co. at Brightwood (Springfield), Mass., recently shipped 10 new passenger cars to the Cleveland, Columbus, Cincinnati & Indianapolis road.

The Chicago & Grand Trunk shops at Port Huron, Mich., are building two passenger cars, a combined mail and express car and a baggage car for the road.

The Harlan & Hollingsworth Co. in Wilmington, Del., is building two dining cars for the Canada Southern road.

The Canton Car Co. at Canton, O., is building 50 freight cars for the Washington & Western road, and has taken a contract to build 500 cars for the Wisconsin, Iowa & Nebraska, a new road.

The Jackson & Sharp Co. in Wilmington, Del., is building 10 new passenger cars for the Canada Southern road.

The Gilbert Car Works are building a lot of the United States Car Co.'s patent screw-lever dump cars for the Burden Iron Co., of Troy, N. Y., and are also filling an order from Australia for the same cars. The Wells & French Co., are building a lot for the Chicago, Wilmington & Virginia Coal Co., and the Gill Car Manufacturing Co., of Columbus, O., are building some for the Cleveland Rolling Mill. The Boston & Maine road has just completed five, and they are so well liked that more have been ordered to be built at once.—*Car-Builder*.

The Toledo Car Wheel & Foundry Co. in Toledo, O., has recently completed works with a capacity of 100 car-wheels a day, besides other castings.

The Jones Car Works at Schenectady, N. Y., are building four Wagner sleeping cars to run over the New York Central road.

Iron and Manufacturing Notes.

Hooker & Colville, in St. Louis, are making 60 pumps for water stations on the Texas & St. Louis road.

The Maumee Rolling Mill Co. has been organized with \$500,000 capital stock, to build a rolling mill at Toledo, O. The Hocking Rolling Mill Co., of Covington, Ky., takes two-thirds of the stock.

The blast furnace at the Katahdin Iron Works, in Maine, is making 18 tons a day of car-wheel iron.

Etna Furnace No. 1, at New Castle, Pa., is in blast. No. 2 furnace is being rebuilt and enlarged.

The Pittsburgh *Telegraph* of recent date says: "The blast furnace at Tecumseh, Ala., has a curious career, and one that will be interesting to furnace men. It was built in 1873, put in blast Feb. 19, 1874, blew on a single hearth from June 19, 1874, until a few weeks ago, being a continuous blast of more than seven years, the longest on record in America. When first blown the output was about 12 tons daily. This was increased to about 30 tons before closing some few weeks ago for rebuilding. It has now been blowing on the new hearth 13 days, and for the last nine days has cast an average of 30 tons No. 1 foundry per day. Gen. Warner thinks the stack will reach 40 tons per day as soon as she is thoroughly heated up and a little more blast put on. He even thinks 50 tons of forge iron not an improbable result."

The Niles Tool Works, in Hamilton, O., recently delivered a very heavy planer to the Cincinnati Southern shops. They have a large number of orders on hand.

Watts, Campbell & Co., in Newark, N. J., are building three stationary engines of over 250 horse-power each, and have much other work on hand.

All the steel rail mills report plenty of work on hand and orders for some time ahead.

The Rail Market.

Steel Rails.—Prices are steady at \$44 to \$46 per ton at mill, according to size of order and time of delivery. No large transactions are reported, but some heavy orders are said to be on the market.

Iron Rails.—Little or no business is reported, and quotations are hard to get.

Rail Fastenings.—Spikes are in demand at \$2.90 to \$3 per 100 lbs., with a small supply. Fish-plates are quoted at \$2.50 to \$2.60, with little business; track bolts, \$3.70 to \$4.20.

Old Rails.—The market is a little more active. Sales are reported at \$27.50 to \$28.50 per ton in Philadelphia for tees, and \$29.50 for double-heads.

Attempt at Train Wrecking.

The engineer of the midnight express on the Lebanon Valley Branch of the Philadelphia & Reading road on the night of Nov. 5 discovered some heavy pieces of timber placed on the track, near Wernersville, Pa. He was unable to stop in time, but luckily his engine threw the obstructions from the track instead of running over them. A short distance farther on he discovered a hand-car on the track, but was able to stop in time. It appears that some one broke into a tool-house, and pushed the hand-car upon the track. No arrests have yet been made.

A New Electric Railway.

The Austrian Ministry of Communications has granted to the Südbahn or Southern Railway Company the concession for the construction of an electric railway to run from Mödling to Brühl in the suburbs of Vienna. This will be the first electric line in the Austrian capital. It will be about three kilometres, or two miles, in length, and will run from the Mödling Railway station on the Southern line, through the village of Mödling, and thence through Klausen to Vorderbrühl. It will be a single line. The gauge is one metre, and the gradients are not to exceed 15 in the 100, while the minimum radius must not be smaller than 30 metres. The maximum speed allowed by the terms of the concession is 20 kilometres, or about 12½ miles an hour. There are to be halting and signal stations at the most frequented crossings, and they are to be connected together by telegraph or telephone apparatus. The carriages of the new line are to contain 18 seats, besides standing room for a few more passengers. Each carriage will be fitted with its own electrical conducting apparatus, and the traffic will be worked by a stationary steam motor of at least 40 horse-power, and two machines for the production of the electric current. The new line is to be finished and be opened for traffic by July, 1883.

Automatic Freight Car Brake.

On Oct. 29 a test was made near Springfield, Mo., on the St. Louis & San Francisco road, with a train consisting of a locomotive equipped with the steam brake of the American Brake Co., 16 freight cars with the improved upright automatic freight car brake of the same company, and a caboose. The total weight of train was 422½ tons. Six stops were made, as follows:

1. Speed 18 miles per hour, down grade of 65 ft. to the mile. Time of stop, 32 seconds; distance 250 ft.
2. Speed 18 miles, down grade 70 ft. Time 38 seconds, distance 250 ft.
3. Speed 25 miles, down grade 65 ft. Time 35 seconds, distance 356 ft.
4. Speed 18 miles, level grade. Time 28 seconds, distance 360 ft.
5. Speed 30 miles, level grade. Time 41 seconds, distance 420 ft.
6. Speed 30 miles, level grade. Time 43 seconds, distance 412 ft.



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EDITORIAL ANNOUNCEMENTS.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subject pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published!

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

THE EDUCATION OF ENGINEERS.

The excuse for saying anything about this rather threadbare subject will be found in a letter of inquiry published in another column in which the writer asks for "assistance" to aid him in advising "a young man, intending to adopt the profession of civil engineer" concerning the completion of his education. As similar inquiries are frequently made, it has seemed proper to write what may perhaps answer other similar questions, or interrogative thoughts, which are entertained by persons interested in the same subject.

It may perhaps clear away some ambiguity and enable the young man who is seeking an education, and those who are about to advise him concerning it, to get a clearer view of what ought to be aimed at if he and they will form a more definite idea of what his career and occupation is likely to be than is indicated by the term "civil engineer." The opinion has heretofore been expressed in these columns, that it would be a distinct advantage to "the arts of directing the great sources of power in nature for the use and convenience of man," and to those who are engaged in the practice of such arts, if the word "engineer" and its derivatives could be entirely eliminated from our language, or their use be abolished. The term "civil engineer" has about it what Edward Everett would have called a "sonorous amplitude" of sound and meaning. It seems to mean more than it does, and experience soon teaches that the occupations it includes, instead of having about them a sort of super-exalted character, are usually very common-place indeed. It sounds well for a young man to say that he intends to be a "civil engineer." Fond mothers like to tell their intimate friends that Edmund intends to adopt that "profession." There is a rhythm about the name of it that makes it agreeable to tell to Angeline in soft and confidential tones, and she is apt to think that it produces a good impression to speak of the favored one as a "civil engineer," when the diamond or plain gold ring first makes its appearance in public. The word engineer carries with it many illusions, which, under such circumstances, it is rather pleasant to entertain, but which, if dispelled, would make the occupation much less attractive than it now is to many young men. In fact, it is only necessary to specify what the work of any engineer really is, and the illusions begin to fade away at once. Thus, accompanying the letter of inquiry published on another page was the card of the writer, whose firm is engaged in practical engineering work. On this card it

is announced that they do railroad and other grading, difficult foundations, heavy masonry and steam pile-driving. Now assuming that the term "civil engineer" is banished from the language, and that our aspirant is aiming to qualify himself for doing the kind of work that this firm is engaged in, and that his aim is to get such an education as will best qualify him to become a railroad grader, to build foundations, to become a stone mason or—a pile-driver, would not the question of the kind of education he ought to seek assume a very different aspect from what it does when he is aiming to become a "civil engineer?" Nevertheless, grading, building foundations, heavy masonry and pile-driving are branches of civil engineering.

But it may be said, that while this is true, the kinds of work named are only some of the branches of civil engineering, that they are not the only work of the "profession," that there is other work in which a thorough knowledge of mathematics and other science is required, and for which a person cannot be qualified who has not had a very complete theoretical training. Unfortunately for some of the theories regarding technical education, this statement is not true. There is not a branch of civil or mechanical engineering now practiced in this country in which the men who have achieved either the greatest distinction or pecuniary success have had a liberal education either classical or technical. If we turn to the special branch to which our young aspirant is looking, that of railroad construction and management, probably not one-fiftieth of those who now occupy prominent positions of that kind in this country have had anything approaching to what we call a liberal education. This shows in an indubitable way that such training is not essential to the success or to the attainment of distinction in these occupations. As a matter of fact, what can be learned in a common school is sufficient to enable a man to become eminent or successful in any branch of engineering. It is not said that a greater degree of knowledge of science or of literature, more skill in the use of language, or more education generally, may not be an additional help to an engineering aspirant.

The truth is, though, that in comparison with other qualifications, the value of any high degree of mathematical or scientific training is very slight. If the relative usefulness of different amounts of education were laid out graphically, so that its value would be represented by the height of vertical ordinates, a curve drawn through the different points laid down would probably assume the form of a semi-ellipse, with the conjugate axis for a base. The beginning of education would be seen to be of prime importance, and the curve would ascend almost vertically. When the elements are mastered, the curve would begin to incline from a perpendicular, and as the common school period is passed the inclination would probably be about 45°, and with the beginning of the course in a technical school, the curve would approximate more and more towards a horizontal line, and the rate of vertical increase would be less and less, until it would begin to descend, slowly at first, but after a certain amount of scholastic training has been attained, the rate of descent would be certain, and after a while rapid. In other words, there is a degree of book learning which is an actual detriment to any one who engages in the occupation, usually included under the general head of engineering. But when this period is reached, our elliptical curve approximates so closely to a horizontal line for such a long distance, and then ascends and descends so little above its base, that it is not worth while to attempt to fix exactly the point at which it would intersect the transverse axis, even if it were possible to do so. What we want to make clear here is, that so far as an aid to success is concerned, it is the beginning of education that is the most important. After that additional attainments are a help, but their value soon begins to diminish, and, after a certain point is reached, more study hinders and does not help to advancement. Those inclined to demur to this statement should, however, not infer more than is expressed. All that is asserted is, that so far as the achievement of success—that is, making money by honorable means—is concerned, the higher technical education is of little or no help. But there is something else in life worth having besides money and the power which it gives. To any one with a liking for what are called engineering occupations, the pleasure to be derived from a thorough scientific and technical education would, to many people, outweigh all the pecuniary sacrifice which it would be necessary to make in getting it, and in the subsequent loss for having neglected other and more effective means of achieving what is ordinarily called success.

It will be well, though, if our young friend should at the outset make a distinction, and determine ex-

actly what he wants most to get. The question might be stated somewhat in this way: the more knowledge he acquires beyond a certain point, the less money will he be able to make. Now it will depend altogether upon his tastes and circumstances as to what course it would be best for him to follow. If he has such a love for science and of knowledge as would make the possession of it a source of great pleasure to him during his whole after life, then we would by all means advise him in selecting the three alternatives named to select the last and to take as thorough a course in one of the schools as he can afford time and money for. If, on the other hand, it is important or desirable for him to earn the most money in the least time, and if he has a fair elementary education, can use his own language with reasonable correctness knows algebra, geometry and trigonometry, with more or less natural philosophy, or "physics," as it is now the fashion to call it, and some knowledge of mechanical drawing, our advice would be to plunge into practice at once.

There is some reason for suspecting, though, that he entertains some of the illusions which were referred to in the beginning of this article. Therefore we advise him never to say or think of becoming an "engineer." We have heretofore quoted the saying of Herbert Spencer, that "Science may be described as definite knowledge, in contradistinction to that indefinite knowledge possessed by the uncultured." In taking the last census in Great Britain those in charge of the work would not accept, as an answer to the question of what a man's occupation was, that he was an "engineer." They decided that the term does not indicate what a person's occupation is with the degree of definiteness demanded by the census. It might be well then if our inquiring friend were to shape his aims and intentions into a form so definite that the British census-takers would accept it as an answer, if they asked him what his occupation is or will be. Our correspondent speaks of his "making a specialty of railway construction and management." It is to be feared that the British census-takers would not regard that as sufficiently definite. In fact it looks a little as though our young friend was a little vague in his ideas of exactly what he proposes to do. "Railway construction" involves a number of distinct occupations. Does he intend to locate lines where none are built? If so, he better attach himself to some party or "corps"—as they love to call themselves—of men in the field who are doing that kind of work. If he wants to learn about the grading of a line and doing the masonry work for its bridges, tunnels, etc., then he had better join a contractor and study the geometry of earth-work and the characteristics of the mule, gunpowder, nitro-glycerine and Hibernian, Italian and African laborers, with more or less of the literature of strikes. For either of these occupations the amount of theoretical education which has been specified would be sufficient for a fair start. If he aims at a knowledge of bridge-building, then he must keep in mind that, expressed after the manner of a boy's composition, there are different kinds of bridges, those made of wood, those made of stone, and those made of iron. Each is a specialty of itself. With geometry, trigonometry and algebra, he can learn how to design and build bridges very much better if he enters the employ of some firm in that line of business than he can in a technical school. If he means to turn his attention to rail-manufacturing, then chemistry would help him, but he could pick up more knowledge which would be useful in a good rail mill than he could in all the laboratories in the world. Besides the mill has the advantage that the young rail-maker can in odd hours learn as much chemistry as he will need, whereas the laboratory has the disadvantage that it is impossible, in it, to get the knowledge which the mill alone can teach.

If he means to learn how to take care of a railroad track, let him join himself to a section foreman—if he has the physical strength for it—as a track laborer for a time; it will develop his muscles, and he will learn how much work a man ought to do in a day, and he will get a glimpse of life from a day laborer's point of view, and thus be able to deal more justly with that class thereafter than he could without such experience. The ethics of doing this is not, we regret to say, usually taught in technical schools.

There is another branch of railroad construction, closely allied to rails, which is yearly growing in importance and in complication. That is the construction of frogs, switches, signals, etc. The business of manufacturing these appliances is carried on in special establishments devoted to this kind of work. There is almost no literature on the subject, and what could be learned about it in schools would be worth comparatively little to know. The best place to learn





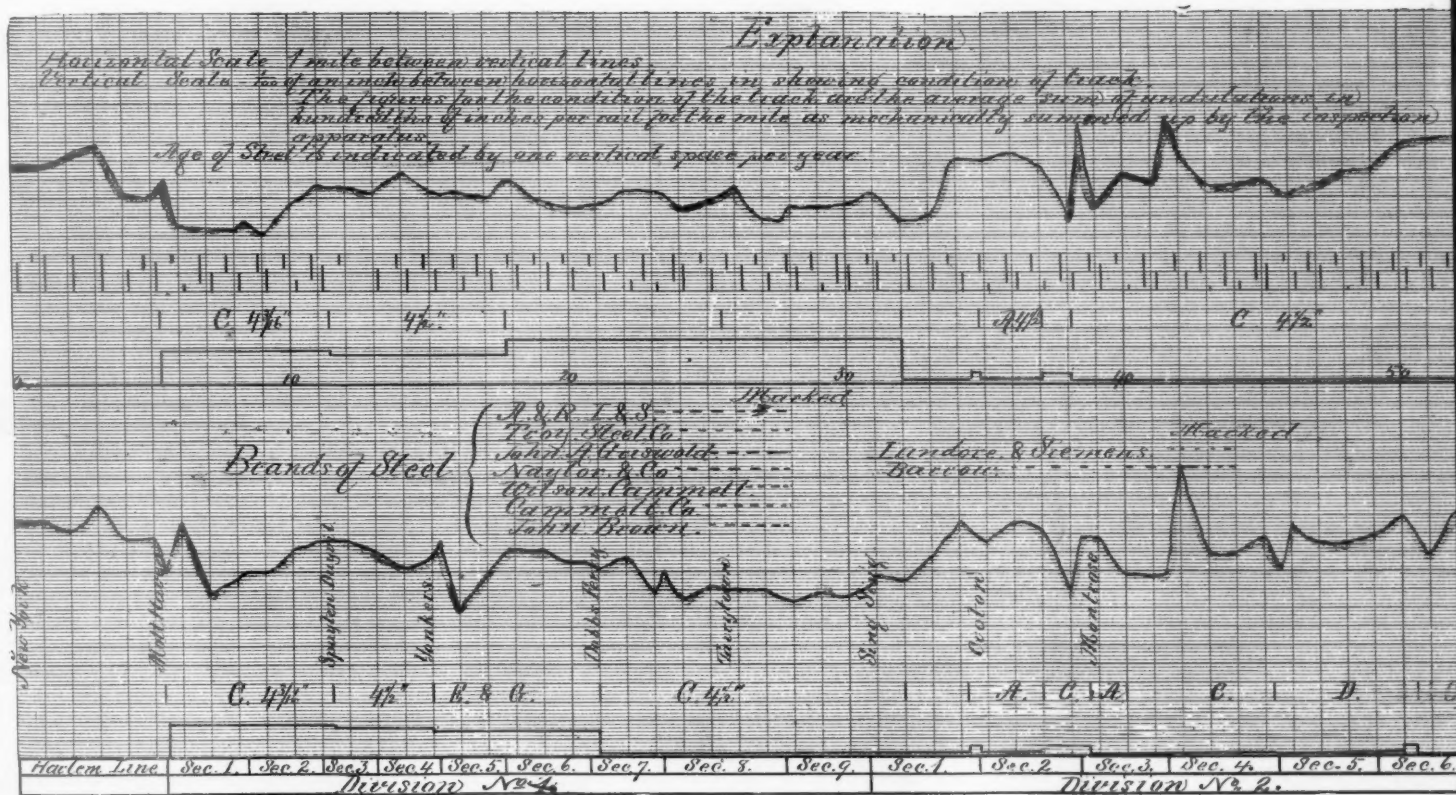


DIAGRAM SHOWING

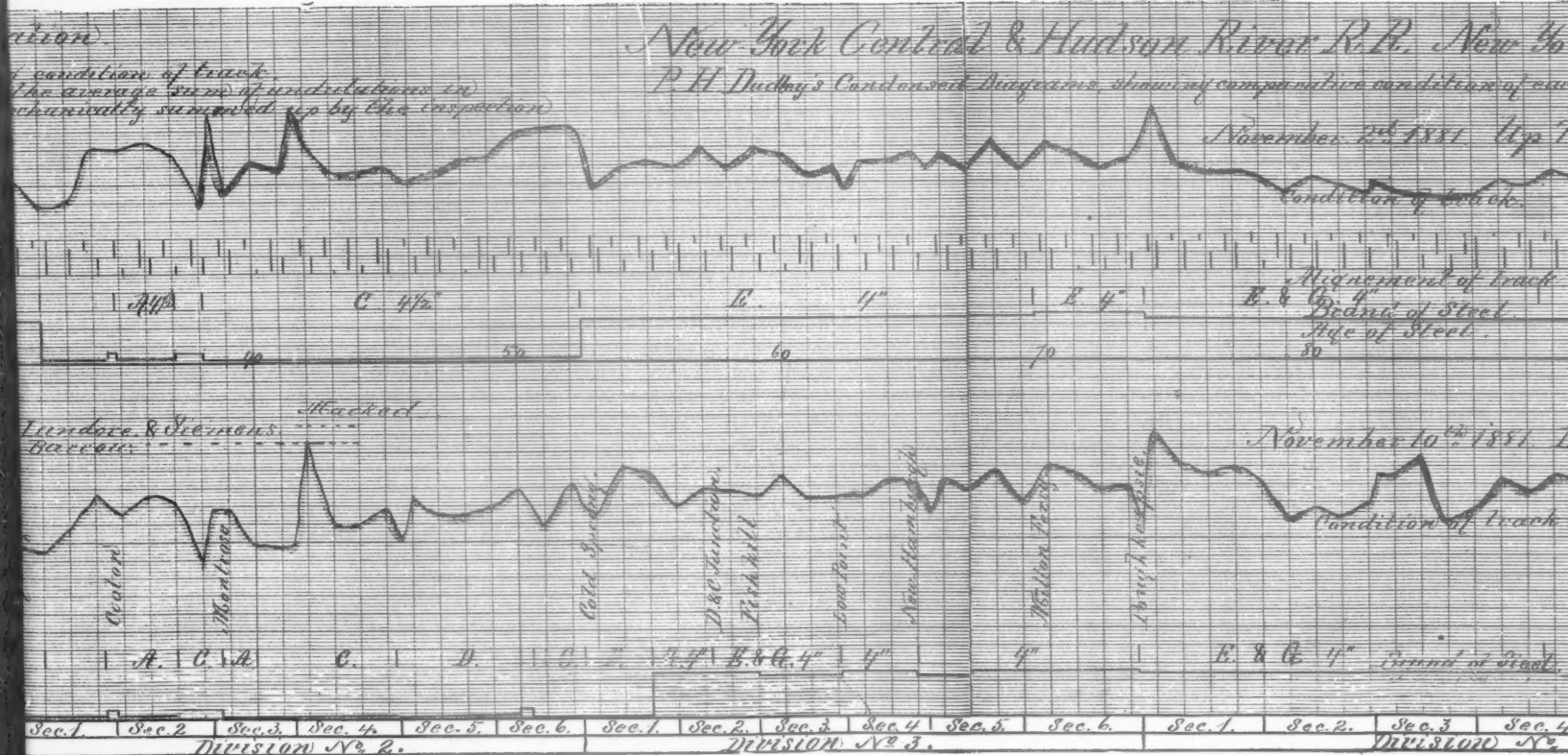


DIAGRAM SHOWING THE CONDITION OF THE NEW YORK CENTRAL RAILROAD TRACK FROM NEW

Condensed from Records made by P. H. Dudley's Dynagraph Car.



how to make frogs and switches is in a frog and switch shop. It is difficult to learn anything about signals any where, excepting in some of the large establishments devoted to that business in England or in one or two shops of that kind here. If this is impracticable, then the would-be learner must imitate the example of a hungry dog and pick up a morsel of information wherever he can find it, as the dog does his food. It will not do either for the learner in such a case to be too fastidious about the way in which such intellectual food is prepared, any more than the dog is about what he eats. The canine's example must also be followed by cultivating an instinct to discern information as the dog scents his food.

When it comes to the telegraph, then looms up the illimitable field of electricity. The science of it which will be most useful to a future railroad constructor or manager could be learned in a few weeks or months in any telegraph office, and the leisure there afforded would give ample time to study up as much of the theory of electricity as will be required in ordinary practice.

Before leaving the permanent structures of railroads, something ought to be said of the stations, shops, water supply, etc. There is no way of getting information about the arrangement of these excepting that which is analogous to the one our hungry dog employs in getting his food. There are no schools, no books, no papers and no persons who seem to have any complete understanding of these subjects. The knowledge of building which an architect ought to have is not referred to. The place to learn that is in the employ of some competent person engaged in doing that kind of work.

If our young student means to turn his attention to the rolling stock of railroads, then the best place to learn how to make locomotives is in a shop where they build them. To learn how to manage them he ought to gain some experience in firing and running on the road, and then study the subject by working steadily at their repair in some railroad shop.

The same thing may be said of cars.

If he means to turn his attention to the traffic, or to the financial management of railroads, the office of a traffic manager or the chief executive office of a railroad would be an infinitely better place to learn what could be turned to account than any school could possibly be.

Many very intelligent persons have been advocates of workshop practice in schools. There are two things which it seems in the very nature of things must always make that kind of training very ineffective. First, there is the absence of the rigid discipline and accountability which exists in a well-managed machine shop, and second, the object for which every shop engaged in business exists is absent in the school. That object is the making of money and the production of machinery at the lowest cost and of the best quality. In a real shop the learner must come early and work regular hours. He must do a fair day's work, and carelessness is not tolerated. He must in a measure compete with his fellow workmen under a rigid supervision. That kind of training alone is of great value to a young man, and that he does not get while playing at workshop for a few hours a day in a school.

But it may be said that the young inquirer does not want to be a railroad locator, a railroad grader and builder, a bridge-builder, a rail manufacturer, a track master, a switch or signal maker, a telegraph operator or superintendent, a locomotive superintendent, master car-builder or traffic manager. It may be that he wants to get a general knowledge of railroad construction and operation and educate himself for a general manager or a president. Now if this is the case, there are some rather awkward questions which ought to be considered. Supposing that after he has completed such an education no one should happen to want him for a general manager or general superintendent, what would he do? It is true that competent men are always wanted for such positions, but those whose services are sought are men who have shown by what they have done that they are competent and have the ability to manage affairs. Our student would have no such reputation after he had laid up a stock of "general information," and he might find himself unable to get employment on the top shelf. Now general information would not help him to get employment lower down. What is wanted there is special knowledge. If he wants to be employed to locate a railroad or design a locomotive he must be able to show that he knows how to do those things as well as or better than other people. In other words, to get employment he must know how to do some one or more things in the best way.

The writer remembers soon after emerging from the chrysalis state of his apprenticeship seeking the help of the man who before that occupied the relation of master to him, in getting employment, and he (the writer) gravely asking his former employer what position the latter would advise the emancipated apprentice to take. The old man hesitated a moment, and then with an expression on his face like that which General Butler probably assumed on hearing the news of the late election in Massachusetts, advised the writer "to take whatever position he could get."

During the same apprenticeship there was a philosopher workman who "run" a drill-press next to the writer of this too-long article. He was given to saying that "in order to get on in the world a man must conceive himself to be a wedge, and when he sees an opportunity he must insert himself." We will finish this article by advising our friend in search of an education, first to abandon the use of the term civil engineer; it will clear away some things that are foggy now; next, to learn to do some one thing, like locating railroads, building bridges, or making signals, or repairing cars as well as or better than any one else; then take "whatever position you can get," and after that conceive yourself "a wedge," and look out for opportunities.

Of course if a young man has wealth and influence and is independent of his own achievements, then the case might be different, and merely for the pleasure it would give a thorough classical or technical education might be advisable. The present or late President of the British Institute of Mechanical Engineers, who is a partner of Sir William Armstrong, determined a year ago in educating his son to succeed him, first to put him in the shop and then give him a classical course at Oxford.

The great practical advantage of an education in "railway construction" is the discipline it gives to the mind, so that the person has the free use of his intellectual faculties, as a gymnast has of his muscles.

Much less training than that of a full course in a technical school or college gives this to a sufficient degree for all the practical purposes of success in what ought not to be called the engineering occupations.

CHICAGO SHIPMENTS.

We follow closely from week to week the course of the rail shipments from Chicago to the East, as the most important record of railroad traffic which is accessible. The completion of the statement for October enables us to compare the movement and approximately the earnings from it for successive months since 1878.

For the month of October the total shipments of freight, not including live stock, billed at or through Chicago eastward to the western termini of the trunk lines or to points further east (Buffalo, Pittsburgh, Wheeling, etc.) have been for four successive years:

Tons.....	1879.	1880.	1881.	1882.
	193,976	179,466	258,074	152,242

Thus the shipments this year are 41 per cent. less than last year, 15 per cent. less than in 1880, and 21½ per cent. less than in 1879.

The rates on grain and flour to New York during the month were 30 cents per 100 lbs. for the first twelve days and 35 for the rest of the month in 1879, 30 cents in 1880, irregular but probably not averaging more than 12½ cents in 1881, and 25 cents this year. The earnings from the shipments based on these rates were:

Earnings.....	1879.	1880.	1881.	1882.
	\$1,288,890	\$1,076,793	\$646,685	\$761,210

The receipts this year were thus 18 per cent. more than last year, it is true, but nearly 30 per cent. less than in 1880 and 41 per cent. less than in 1879. In the two earlier years higher rates combined with larger traffic to make the earnings greater. Indeed, the earnings from this traffic in October, 1879, have never been exceeded in a month when navigation was open except in June and November, 1880 (and navigation was closed one week of the month in that November). The earnings in the month this year were about \$5,000 less than in September; but larger than in any other month of this year probably, and certainly larger than in any other month since March.

The Chicago shipments each month for four successive years have been:

	1879.	1880.	1881.	1882.
January.....	195,102	163,725	263,873	321,148
February.....	200,000	166,552	204,331	225,816
March.....	258,484	318,974	218,957	179,144
April.....	295,314	186,021	268,163	158,474
May.....	282,010	125,089	171,430	115,771
June.....	253,868	223,936	242,463	115,805
July.....	145,286	160,154	259,253	95,030
August.....	162,357	169,315	261,067	138,241
September.....	134,159	151,564	265,414	153,234
October.....	194,026	179,466	258,074	152,242

Ten months.....	1,224,310	1,845,010	2,413,485	1,634,485
Year.....	2,471,738	2,309,640	2,889,317	.....

The shipments in October of this year were nearly

the same as in September, it appears, and larger than in any previous month since March. From September to October there was a slight decrease last year also, but a large increase in the other two years. In those years, however, there was a large decrease from August to September, when in 1881 and 1882 there was an increase.

In all probability the shipments in November and December this year will be larger than in September and October, and very likely larger than in the corresponding months of 1879, and possibly (though not probably) as large as in 1880, yet the total movement of this year must still be much less than in any of the three preceding. For the ten months the shipments have been nearly one-third less than last year, 11½ per cent. less than in 1880, and 23 per cent. less than in 1879. To bring up the receipts to a level with those of 1880 even there must be 675,155 tons forwarded in November and December—more than there ever has been in any two months. Rates being lower than in previous years, and likely to continue lower until January we should say, even with larger shipments there will not be so large earnings from this traffic as in 1879 and 1880, though certainly much more than last year. In 1879 the pressure of traffic was such that the rate was advanced from 35 to 40 cents Nov. 10, and remained at 40 cents until March. In 1880 an advance from 30 to 35 cents was made Nov. 27, and except in February, when 40 cents was charged, this rate was continued till April 13 in the following spring. Very likely the present 25-cent rate can be advanced to 30 cents about the 1st of December, but according to present appearances this is the most that can be expected. A larger winter traffic than in 1879 or 1880, therefore, is not likely to bring in as large receipts to the railroads.

The east-bound traffic from Chicago is larger than any other in the country, and is certainly of great importance. It is possible to exaggerate its importance however. As it is the only important traffic of the kind reported, it is much commented upon as an indication of the general course of traffic. But other east-bound traffic even does not always follow the fluctuations of the Chicago shipments. Last January, when the Chicago shipments were larger than ever before, the other east-bound shipments were exceptionally small; in July, when the Chicago shipments were smallest, from places further south shipments were large. And as the live-stock shipments are not included with the freight shipments, and the west-bound shipments to Chicago are quite independent of them, the reports are not by themselves a sufficient criterion of the course of Chicago business, especially when navigation is open and the chief shipments of grain are by lake. But we may get some idea just how important the reported Chicago freight shipments are by calculating the total earnings from them. We can not do this exactly, but the figures below, which are found by multiplying the total tonnage by the grain rate to New York, will not be far from the truth. Some of the freight does not go as far as New York, and some of it pays a rate higher than the grain rate; but the errors on these accounts will balance each other, we assume. Calculated in this way, the gross earnings of the through freight shipments by rail from Chicago to the East have been as follows in successive years:

	1879.	1880.	1881.	1882 (ten mos.)
	\$11,051,390	\$15,334,642	\$12,534,011	\$6,288,301

In 1879 there were irregular and very low rates until near the end of August, but rates were higher afterwards than they have ever been in the fall months since, and 35½ per cent. of the earnings of the year were made in its last quarter. In 1880 rates were maintained throughout, and the earnings were \$4,183,000 (38 per cent.) more than in 1879. In this year nearly a third of the receipts were in the first quarter of the year, and about 40 per cent. only in the second and third quarters. In 1881 a railroad war ruined rates for the last 28 of the 52 weeks. What effect this had on earnings may be judged by the fact that while 52½ per cent. of the total tonnage was carried in the last half of the year, the earnings then were but \$3,935,539, against \$8,598,472 in the first half. And this year we estimate the earnings in the first two months as but 10.2 per cent. of the total for the ten months, while the tonnage shipped then was 33½ per cent. of the whole, and in September and October the earnings must have been nearly a fifth larger than in January, though the tonnage was not half as great.

We are, however, losing sight of the absolute importance of the earnings from these Chicago shipments. They were much larger in 1880 than in any other year before or since, and then were a little more than \$15,000,000. These earnings were divided among the several roads forming lines from Chicago to the

Eastern seaboard. The largest share of any road out of Chicago was that of the Michigan Central, which had 31 per cent. of the whole until June, and 26 per cent. thereafter. This share of this traffic in this most productive year must have been worth to the Michigan Central about \$1,270,000, or rather that was about the amount of its gross earnings from it—\$4,470 per mile for the part of the road over which this traffic passes. This is an important sum, but it is still but one-seventh of the Michigan Central's total earnings in 1880. This year in September and October its 24½ per cent. of the traffic must have yielded about \$55,000 per month, or at the rate of \$660,000 a year—a smaller proportion, a lower rate, and a smaller total traffic combining to reduce its earnings from this business. At this rate the earnings of this road on this traffic are \$600,000 per year less than in 1880, and this is more than 3 per cent. on its stock. There is not, however, a loss of \$600,000 or anything like it in the profits of the Michigan Central from this traffic. It costs a great deal to carry it, and the net earnings at a 30 cent rate even can hardly be as much as 50 per cent.—nearer 33½ now we imagine.

On longer lines with a large percentage of the business the loss is greater in amount, but not usually as great in proportion to capital stock. The Lake Shore's earnings from the Chicago shipments in 1880, when it had 26 per cent. of them until June and 23 per cent. in the other seven months, were about \$2,040,000 gross—\$3,778 per mile of main line. This year, with 21½ per cent. of the traffic, its earnings from it were about \$90,000 a month in September and October, and at the rate of \$1,080,000 a year, or \$960,000 less than in 1880. This is a little less than 2 per cent. on the Lake Shore's stock; but here again it must be remembered that this traffic is not carried without expense, and that the loss in net is not nearly so great as that in gross earnings.

These two Vanderbilt roads are the only ones which have a smaller proportion of the traffic this year than in 1880. The Fort Wayne had then 25 per cent. before June, and 23 per cent. afterwards; now 25½ per cent. The decrease in earnings from the traffic will therefore be less in comparison over these other roads than over those for which we have calculated it.

All the comparisons, it should be remembered, are with the year in which the gross earnings from this traffic were larger than ever before, and the net earnings very much larger—a year in which the Lake Shore earned above fixed charges \$11.28 per share of stock, and the Michigan Central \$9.11. They are made with the best two months of this year so far, but in all probability the average of the present crop year will be much better.

It is clear, however, that the Chicago freight shipments to the East are not now, and are not soon likely to be, as profitable as in the latter part of 1879, the year 1880, and the first half of 1881. The year 1880 was especially a remarkably favorable year for through traffic and profits, and those who assumed that it was only the beginning of a long series of such years are likely to be disappointed. The inevitable result of a continuance of such profitable through business would be the multiplication of through lines; and in all probability the very favorable outcome of that year's through business had much to do with the construction of the new lines that are now nearly ready to take a share of the Chicago shipments to the East.

It is well to bear in mind that the local traffic is now relatively more important than before the railroad war. There is no doubt that it is now generally decidedly larger than in 1880, and without much change in rates. Passenger traffic both through and local has also grown decidedly, and with a reduction in the earnings from through freight this makes the latter for the present comparatively a less important part of railroad business than it was. The large increase in the earnings of the Pennsylvania Railroad in this year of reduced earnings from through east-bound freight is sufficient evidence of this, which, however, is also supplied by the returns of such other roads with through traffic as report.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Atchison, Topeka & Santa Fe.—The San Pedro Branch is completed from San Antonio, N. M., east to Carthage, 9 miles.

Chicago & Atlantic.—Track laid between Lima, O., and Huntington, Ind., 37 miles, and between North Judson, Ind., and Rochester, 23 miles.

Corning, Cowanesque & Antrim.—The Cowanesque Valley Branch is extended from Elkland, Pa., west to Knoxville, 7 miles.

Kansas City, Springfield & Memphis.—Extended from Loveland, Mo., east by south to Norwood, 16 miles.

Marquette, Houghton & Ontonagon.—Branches have been completed to Wetmore Mine, Mich., 1 mile; to Beaufort Mine, 2½ miles, and to Erie Mine, 5½ miles.

Norfolk & Western.—The New River Division is extended northwest to Glenlyn, Va., 20 miles.

Northern Pacific.—Extended from Merrill, Montana, west 30 miles. The Fargo & Southwestern Branch is completed from Fargo, Dak., west by south to Sheldon, 40 miles.

Pittsburgh & Western.—Extended from Chewton, Pa., north to New Castle, 10 miles. On the Parker Division (gauge, 3 ft.) extensions have been completed from Parker north to Foxburg, 4 miles, and from Baldrige south to Callery Junction, 7 miles.

St. Louis & San Francisco.—The Arkansas Division is extended from Mountainburg, Ark., south to Van Buren, 21 miles. The Springfield Southern Branch is extended from the James River south to Ozark, Mo., 10 miles.

Trinity & Sabine.—Extended from Moscow, Tex., east 5 miles.

Union Pacific.—The Greeley, Salt Lake & Pacific Branch is completed from Greeley, Col., west to Stout, 39 miles.

This is a total of 287 miles of new railroad, making 8,731 miles thus far this year, against 6,008 miles reported at the corresponding time in 1881, 4,946 miles in 1880, 2,987 miles in 1879, 1,777 miles in 1878, 1,867 miles in 1877, 1,931 miles in 1876, 1,128 miles in 1875, 1,594 miles in 1874, 3,288 miles in 1873, and 6,106 miles in 1872.

THE COTTON MOVEMENT so far this crop year has been lighter than might have been expected from the yield reported. This, however, was chiefly due to the late season. Last year the drought which made the crop a very light one also made it early, and September receipts were larger than this year. The receipts in September and for the nine weeks ending November 3, are reported as follows by the *Commercial and Financial Chronicle*, in bales, for five successive years:

	1882.	1881.	1880.	1879.	1878.
September.....	296,957	420,777	403,664	410,639	377,448
October.....	1,126,709	994,269	1,148,400	1,036,583	810,781
Nine weeks.....	1,423,666	1,424,046	1,642,064	1,447,222	1,188,229

The period called "September" here includes the first 29 days of that month, and "October" the five weeks following.

It will be seen that the receipts this year were much less in September but as much more in October than last year, and that the October receipts were nearly as large this year as in 1880, which was the year of the largest crop.

The movement this year, however, is not adequately represented by the figures for "bales," as a bale is a very crude unit, sometimes 500 lbs. and sometimes 460. The average weight this year was 496½ lbs., while last year it was but 479½. This gives for the total crop marketed in the nine weeks (including considerable not in the seaboard receipts), 722,570,218 lbs. this year, against 697,241,873 lbs. last year—an increase of 3½ per cent., though there was a decrease of ½ per cent. in the number of bales marketed.

The "overland movement" this year—the shipments from the interior of the South directly by rail to Northern ports or interior places of consumption, very little of which appears in the seaboard receipts—amounted to but 131,993 bales this year against 201,441 last year—a decrease of 34½ per cent. This traffic gives long hauls to the railroads, but usually very little profit, as they have to compete with the Ohio and Mississippi River steamboats as well as the ocean vessels.

By some of the routes the decrease is very large this year, as will be seen below:

	1882.	1881.	Decrease.	P. c.
Shipped over:				
Cairo & Vincennes.....	9,885	31,047	21,162	68.1
Jeffersonville, Madison & Ind.....	6,868	24,478	17,610	72.0
Louisville, Cin. & Lexington.....	4,825	16,720	11,895	71.0
Cincinnati Southern.....	9,084	26,407	16,723	63.3

At the different crossings of the Ohio and the Mississippi the shipments were:

	1882.	1881.	Inc. or Dec.	P. c.
St. Louis.....	50,471	62,158	Dec. 11,687	18.8
Above St. Louis.....	31,842	20,063	Inc. 10,779	53.7
Cairo.....	10,670	32,886	Dec. 22,216	67.6
Evansville.....		1,141	Dec. 1,141	100.0
Louisville.....	17,401	51,187	Dec. 33,786	66.0
Cincinnati.....	16,765	30,683	Dec. 13,918	65.0
Elsewhere.....	10,849	3,323	Inc. 7,526	22.7

Total..... 131,993 201,441 Dec. 69,448 34.5

It is easy, however, to attribute too much importance to this movement in its effect on earnings. The large shipments last year were equal in weight for the two months to only about 1,600,000 bushels of wheat, or 1,700,000 of corn, and this is not more than two days receipts at Chicago or New York have been sometimes.

The cotton exports for the two months were:

	1882.	1881.	Inc. or Dec.	P. c.
September.....	118,329	193,918	Dec. 75,589	39.0
October.....	538,477	388,504	Inc. 149,973	38.6

Two months..... 656,806 582,422 Inc. 74,384 12.8

The October exports were about double the September exports last year; this year they were four and a half times as great.

A NEW LINE TO LAKE SUPERIOR is made by the completion last week of the Superior Branch of the Chicago, St. Paul, Minneapolis & Omaha Railroad. This is itself a branch of what was formerly the North Wisconsin Railroad, designed to extend from the St. Paul & Omaha line 24 miles east of St. Paul, northeast 160 miles to Lake Superior at Bayfield, and now nearly completed. The Superior Branch from its junction with this line north to Superior, at the west end of Lake Superior, is about 60 miles long, and it makes a line from St. Paul to Superior, 166 miles long, against 155 by the St. Paul & Duluth. The Superior line, however, is not to be worked in connection with

the Bayfield line alone, but is being extended from the junction with that line southeast to Chippewa Falls, making with the Bayfield line a St. Andrews cross, and affording, in connection with the Chicago & Northwestern, the most direct line between Chicago and the eastern terminus of the Northern Pacific. This line is built by the Chippewa Falls & Northern Company, and is about 141 miles long to Superior, from the junction with the St. Paul & Omaha line at Eau Claire. In connection with the Northwestern it will make lines from Superior 463 miles to Chicago, and 394 miles to Milwaukee. By the Chicago, Milwaukee & St. Paul the distance would be one mile less to Chicago and 377 miles (17 miles less) to Milwaukee. Another and quite direct route to Milwaukee is possible in connection with the Wisconsin Central. Thus the company is by no means dependent upon a single eastern outlet.

The distance from Chicago to Superior (or Duluth) by way of St. Paul and the St. Paul & Duluth Railroad is 554 miles, so the new line will be much the shorter. If the Northern Pacific traffic in winter went by way of Duluth, or there were large accumulations of grain there after navigation closed, this might become an important line. But as in fact the Northern Pacific has a line to St. Paul as well to Duluth and Superior, and as so far most of the wheat produced on its line is not shipped by lake at Duluth or else, where as grain, but is ground by the Minneapolis mills, and must be carried thence, the prospect for a large traffic for the new Lake Superior line from this source is not very good. While the new line is shorter to Duluth or Superior, to Brainerd, past which all Northern Pacific freight must be taken, it is but 545 miles to Chicago via St. Paul, against 577 miles via Superior, and as the Northern Pacific will get 25 per cent. of the haul by way of St. Paul, and less than 20 per cent. of that by Superior, it of course will be to its interest to have the grain go east and the lumber west by way of St. Paul.

The new line is important to the St. Paul & Omaha Company, however, aside from the amount of traffic it is likely to carry, because it will lessen its dependence on other roads for a lake outlet. It will be able to cultivate shipments to Lake Superior from its whole great system of roads southwest of St. Paul, and during the season of navigation will be able in this way to affect materially the rates from the Mississippi to Chicago and Milwaukee which it will be possible for the Northwestern and the Milwaukee & St. Paul roads to charge. That is, a line to Lake Superior gives the company a substantial addition to its power, and may compel its rivals and allies to treat it with due, and perhaps with undue, consideration.

CHICAGO RAIL SHIPMENTS EASTWARD for the ten days ending Oct. 31 were 51,062 tons this year, and at the rate of 34,041 per week, and comparing the corresponding weeks for three successive years they have been:

	1880.	1881.	1882.
Tons.....	44,200	62,295	34,041

Thus this year the receipts were 45.1 per cent. less than last year and 23 per cent. less than in 1880. The earnings from the shipments must have been about at the rate of \$1,000 this year to every \$916 last and every \$1,560 in 1880.

For seven successive weeks these Chicago shipments have been:

	Week ending.								
Sept. 14.	Sept. 21.	Sept. 30.	Oct. 7.	Oct. 14.	Oct. 21.	Oct. 28.	Oct. 31.		
36,878	35,611	33,076	32,810	34,790	33,580	34,049			

The fluctuations have been very small in this period, and especially in the last five weeks.

Of the shipments for the last ten days in October the Chicago & Grand Trunk carried 16 per cent., the Michigan Central 24.3, the Lake Shore 16.9, the Fort Wayne 16.6, the Pan-handle 18, and the Baltimore & Ohio 8.3 per cent. Thus the two Vanderbilt roads had 41.2 per cent. of the whole, and the two Pennsylvania roads 34.5 per cent. Again the Fort Wayne has an exceptionally small percentage, and the Pan-handle an exceptionally large one, due, we understand, to the crowding of the Fort Wayne near Pittsburgh.

For the week ending Nov. 4 the shipments billed at Chicago (exclusive of shipments from points west billed through Chicago, which are included above) were 31,052 tons this year, against 45,793 in the corresponding week of last year and 26,027 tons in the previous week of this year. These are the largest shipments for a long time. Of the decrease of 14,741 tons from last year 2,560 tons were flour and 6,099 tons grain, and the very large amount of 6,082 tons was provisions, of which there is very little to ship and which is shipped by rail almost exclusively. There was an increase in lake shipments for the week, compared with last year, from 626 to 4,643 tons of flour, and from 35,241 to 54,696 tons of grain. The railroads carried 74 per cent. of the total grain and flour shipments last year and only 29½ per cent. this year—for which the difference in rates sufficiently accounts. The gross earnings from the total shipments must have been about at the rate of \$1,000 this year to \$740 last year.

Lake shipments will not be made for more than three weeks now, and during this time only by a small fleet, as even an advance in rates will not at the very close of the season attract vessels from the iron trade or cause those that are laid up to come into the market for cargoes. Whatever is carried until next spring, therefore, must nearly all go by rail. The movement may be light for another month, but there are indications that by December or January there may be a heavy grain movement. There may be no haste about marketing the great stocks of wheat, but the supply of corn in the consuming districts of the East and in Europe is extraordinarily small, and as soon as the crop is fit for the market an active movement may be expected for a time.

THE REVIVAL OF WHEAT EXPORTS since harvest has been more marked than most of us seem to suppose. It has been concealed by the almost total cessation of corn exports, which last year, even in the fall, were almost as large as the wheat exports, and partly also by the larger proportion of the wheat that has been exported in the form of flour.

For the eight weeks ending Nov. 2 the exports from Atlantic ports for two years have been:

	1882.	1881.	Inc. or Dec.	P. c.
Flour, bbls.....	1,067,443	480,960	I. 577,474	117.7
Wheat, bus.....	20,285,310	10,954,189	I. 9,331,121	85.2
Corn, bus.....	914,743	8,373,434	D. 7,458,691	89.0
Other grain.....	437,693	1,006,139	D. 568,446	56.5

	1882.	1881.	Inc. or Dec.	P. c.
Flour and grain, bus.....	26,441,239	22,538,022	I. 3,902,617	17.3

Thus in the only export grain yet harvested there is an enormous increase in the exports, amounting in wheat and flour together to nearly 12,000,000 bushels and nearly 98 per cent. There has been some complaint of the indisposition to market our crops at present prices, but the wheat exports have certainly been very satisfactory. The fact that a much larger proportion than heretofore goes in the form of flour doubtless leads many to miscalculate the total movement. Last year the flour exports were 16.7 per cent. of the wheat and flour exports; this year 19.1 per cent. This growth of the milling industry has a very considerable effect on the grain movement, aside from its reduction of the seaboard receipts of wheat. The wheat is forwarded from the West largely by lake and canal; the flour not at all by sailing vessels or canal boats, but exclusively by rail and by steamers between the lake ports and Buffalo—and mostly by rail. Thus the grinding of the wheat in the West tends to increase the business done by rail. Again, the wheat is exported largely from Montreal, Baltimore, Philadelphia and New Orleans, but the flour goes chiefly from New York and Boston, and particularly very little goes from Baltimore and New Orleans. Thus some ports gain and some lose by the grinding of the grain before it reaches the seaboard.

The corn exports, on the other hand, have been but one-ninth what they were in the corresponding eight weeks of last year; we have needed at home all the corn we had, and indeed have had a short supply for our own use. But if the estimate of the Department of Agriculture is correct as to the crop of corn this year, there will be a fair surplus for export as soon as the new grain becomes marketable—not much before January, probably. The stock on hand for consumption is so short, however, that the new corn will probably be absorbed chiefly in replenishing these stocks for some time after it begins to come forward, and a revival in the export of this grain may possibly not begin till mid-winter. When it does come, if the wheat exports keep up at the rate of the past three months, we shall have positively large grain exports, in spite of the good crops abroad.

THE OFFICE OF ARBITRATOR FOR CO-OPERATING RAILROADS has very recently become an important one, and that the railroad companies so regard it is evident by the character of the men they select for the place. Two qualifications are required in combination for which (together) there has heretofore been no especial demand. Knowledge of the business concerning which decisions must be made has always been in great demand, and has been developed to a high degree in the work of traffic management by general freight and passenger agents, and often by general superintendents, general managers and presidents. But knowledge of the business itself, and of the means by which traffic is developed and diverted does not, except in superior minds, bring a grasp of the principles that govern the business, which is indispensable to a satisfactory discharge of the duties of arbitrators. It may be said, however, that only among those familiar with the facts of traffic management is a knowledge of the principles likely to be found.

Further than this, however, is required the judicial mind, very rare in nearly all occupations, and perhaps especially rare among those engaged in the conduct of a business in which there is much competition. The man who habitually looks at both sides and weighs carefully and without prejudice the evidence on each is the man who is needed to judge between rival claimants; and to find such a man who has also the requisite knowledge of railroad business and of the principles governing it is no easy task. Moreover, the arbitrator, like the judge, must not only have these qualities, but he must be known to have them, else he cannot command the confidence of those whose conflicting claims he must decide.

The result is that the men whom the railroads want as arbitrators must always be eminent and exceptionally able men, and as such railroad men usually occupy very important places, it is by no means easy to get them when found. The three leading Chicago combinations, the Iowa Trunk Lines, the Southwestern and the Colorado associations, last week chose as arbitrator Mr. C. C. Wheeler—who occupies the very important position of General Manager of the Atchinson, Topeka & Santa Fe Railroad, and as such has the charge of more than 1,800 miles of road. Mr. Wheeler had a long experience on the Chicago & Northwestern, part of the time as General Freight Agent, and so has the experience and the knowledge desirable in an arbitrator, and the opinion held of his possession of the other qualities required is sufficiently shown by his unanimous choice to the position, which, as relieving the incumbent from the weight of the duties of active railroad management, has many attractions, especially to a thoughtful and studious man, who is the one needed in the place.

THE APPORTIONMENT OF THE CHICAGO SHIPMENTS EASTWARD which was made by Mr. Fink about June last was not accepted by the Chicago & Grand Trunk, which appealed

to the Arbitrator, Mr. Charles Francis Adams, Jr., in July. There was great delay in submitting the facts and arguments in the case, but this has enabled the Arbitrator to have recourse to the statistics of the actual course of shipments under existing circumstances. He submitted his decision a few days ago, and by it he confirms Mr. Fink's award. We now repeat the percentages allotted to the several roads under the several awards since the business was first divided:

	C. & G. T.	Mich. Cen.	Lake Shore.	Fort Wayne.	P. C. & St. L.	B. & O.
Award of 1878.....	31	26	25	10	8	8
June 1, 1880.....	10	26	23	23	10	8
March 13, 1882.....	11	24½	21¼	25¼	10	8

The actual division of the traffic from March 13 to Oct. 31 and during the month of October has been:

	C. & G. T.	Mich. Cen.	Lake Shore.	Fort Wayne.	P. C. & St. L.	B. & O.
March 13 to Oct. 31.....	13.4	21.6	17.4	29.2	10.4	8.0
October.....	12.2	24.1	18.8	22.4	14.8	7.7

Early last spring the Grand Trunk carried a very large proportion of the business, and this makes its average for the season larger than recently.

It would seem from the record of the actual division of the traffic that it is the Pennsylvania rather than the Grand Trunk that suffered by Mr. Fink's award. In the 7½ months its roads have carried 39.6 per cent of the whole, against 35½ per cent. by Mr. Fink's award. The two Vanderbilt roads, which are awarded 45½ per cent. of the business, have carried but 39 per cent of it. There remains to be made up to them in freight or money the equivalent of 65,275 tons of freight, which is equal to about two weeks' total shipments from Chicago.

THE PENNSYLVANIA RAILROAD COMPANY again adds to its capital, making a half yearly dividend of 4½ per cent., 2 per cent. of which is payable in scrip exchangeable for stock. As, after this was known, the \$50 shares were quoted at \$30 ex-dividend, the 2 per cent. scrip dividend is worth 2.4, so that the value of the dividend on \$100 of stock to the stockholder is \$4.90. This scrip dividend will amount to \$1,675,731, and make the capital stock of the company \$85,462,301. The New York Central's is \$89,428,300; the Erie's \$84,575,300. The Pennsylvania has been making large additions to its property in the way of improvements; and as its funded debt is \$73,000,000, and it is liable as lessee and guarantor for the interest on an enormous mass of other stocks and bonds (but also the owner of a somewhat less enormous mass), it seems much wiser to raise new capital by new stock than by bonds. In prosperous times like these it has plain sailing, but now is the time to strengthen its position for the evil days that will come sometime in the future, and this the company seems to be doing. If there is not too much railroad construction in its territory, however, many of the lines which for several years after 1873 were a burden to it are likely to take care of themselves, even in bad times, hereafter; while others that were profitable after 1873 are likely to be more profitable always hereafter. The multiplication of new roads, however, may greatly damage these good prospects. Some one may take it into his head to duplicate the Fort Wayne, or make a new route between Philadelphia and Pittsburgh or New York and Philadelphia, and the company needs to be prepared for emergencies.

Dynagraph Diagrams.

The folded plate with this number gives condensed diagrams taken from records made with Mr. P. H. Dudley's dynagraph in his inspection car, showing the condition of the track of the New York Central & Hudson River Railroad from New York to Albany. Both tracks are shown on one sheet, the upper diagram representing the up-track and the lower one the down-track. The base line for the upper diagram is the horizontal line extending through the middle of the engraving. The base line for the down-track is near the lower edge of the engraving.

In running over the track the dynagraph instrument, in the inspection car, draws a diagram showing the undulations or unevenness due to rough or bent rails, low joints, deflection of loose rails and ties, defective ballast and drainage, deficient tamping or other causes, and mechanically sums up the amount of these vertical inequalities per mile into feet and inches. This amount, reduced to inches and divided by 176 (the number of 30-ft. rails per mile), gives the average undulation per rail. For example: on the up-track of the first mile out of New York the number of feet of undulations of the right rail was 8 ft. 6 in.; of the left rail, 8 ft. 9 in.; the average is 8 ft. 7½ in., which reduced to inches and divided by 176 gives ½ of an inch as the average undulation of each rail per mile; for the second mile it was ⅔, for the third mile it was ⅔, and for the fourth mile it was ⅔ of an inch. In like manner the average results are found for each mile of the whole road.

In the diagram the spaces between the vertical lines represent the miles of the road, and the horizontal lines represent ⅓ of an inch of undulation; each fifth line is made heavier for convenience of counting.

In plotting, the condition of the first mile of the up-track, whose average undulations per rail are equal to ½ of an inch, the diagram begins at the fifty-ninth line, and is drawn horizontally for the first mile. The average undulations of the second mile are ⅔ of an inch. The diagram is therefore carried upward to the sixty-second horizontal line. For the third mile the undulations are ⅔, so the diagram goes up to the sixty-fourth line, and for the fourth line they are ⅔, so the diagram is carried down to the fifty-second line.

The point at which the diagram line crosses the vertical line on the right hand side of the mile space represents the average condition of the track in that mile. This is somewhat confusing, and it would seem as though it would have been very much clearer if the average undulations for each

mile had been represented by a horizontal line at the proper distance above the base line, as in the first mile. Then the height of the diagram line above the base would have indicated the condition of the track. Now, it is the height of the point of intersection of the diagram line with the vertical on the right side of the mile span which shows its condition.

In cases where a section ends with only a part of a mile, the height for the fraction of the mile is plotted and the diagram drawn accordingly.

The proportion of straight and curved line in each mile is represented by short vertical black lines in each of the mile spaces below the diagram and above the base-line. The lines representing the curves are on the right, and those representing the straight line on the left of the spaces.

The horizontal lines at different distances above the base lines represent the age of the steel rails. Each vertical space above the base-line represents one year. The letters above these lines indicate in cipher the makers of the rails, but the real names we are not permitted to make public.

With reference to this diagram, Mr. Dudley says:

"The indications shown by the condensed diagrams of track inspection from New York to Albany are of more than ordinary interest to railroad people.

"Similar characteristics of track and conditions are rarely found covering so many miles. The line being practically level, the indications are nearly free from the effects of gradients, except at Montrose, Peekskill, Poughkeepsie, Tivoli and Greenbush stations, and there they are slight. The long service of the best former brands of steel gives the opportunity of seeing how smoothly they have worn, under heavy trunk-line traffic, over a long series of miles and sections.

"The results confirm what has been found in shorter distances, viz.: that good rails wear comparatively smooth. As must be expected, each year's traffic will wear the steel; but whether it wears down evenly or unevenly depends somewhat upon its quality.

"On the up-track, miles 6 to 32, and from 52 to Albany, the steel has been in service from eight to twelve years (for age of each particular mile, see engraving); and though there are some worn and low joints, the general surface of the rails is smoother than some brands recently laid from the thirty-second to the fifty-second mile. The steel in the down-track, from the twenty-first to the thirty-second mile, is much better, while that from the thirty-second to the fifty-fifth is similar to that of the up-track. Such rails have a very uneven surface, which the trackmen are unable to improve; and, further, the rails work loose under the spikes, cutting into the ties, keeping the latter loose in the ballast. These characteristics have been frequently noticed on various roads.

"The effect of increased tonnage per freight-car wheel is reflected by the increased undulations of the down-track. The same locomotives, passenger and freight cars pass over each track, but on the up-track they are light or are lighter loaded. The 4½-in. rail shows better results than the 4-in. rail."

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:
Baltimore & Ohio, annual meeting, at the office in Baltimore, Nov. 20, at 10 a. m. Transfer books close Nov. 9.
Allegheny Central, annual meeting, at the office in New York city, Dec. 6, at noon.
Old Colony, annual meeting, at the United States Hotel in Boston, Nov. 28.
Ft. Worth & Denver City, annual meeting, at the office in Ft. Worth, Tex., Dec. 12. Transfer books close Nov. 12.

Dividends.

Dividends have been declared as follows:
Cleveland & Pittsburgh (leased to Pennsylvania Company), 1½ per cent., quarterly, payable Dec. 1. Transfer books close Nov. 10.
Boston & Maine, 4 per cent., semi-annual, payable Nov. 15.

Foreclosure Sales.

The Marietta & Cincinnati road is advertised to be sold at Chillicothe, Dec. 9, the necessary notice having been given. The details of the plan of reorganization and the various classes of securities to be issued by the new company have been published heretofore. The Court's official appraisers have taken an inventory and have valued the property at \$6,554,825 for the whole road.

American Society of Mechanical Engineers.

The annual meeting of the American Society of Mechanical Engineers was held in the Turf Club Theatre, New York, Nov. 3 and 8. About 75 members were present. The President stated that the membership had increased during the year just closed from 297 to 354, including the list elected at this meeting, which included 10 honorary members, 39 members (including two promoted from associates), 1 associate and 1 junior member.

President Thurston delivered a long and carefully prepared address, in which he referred to the problems now engaging the attention of engineers, including the best materials of construction and the handling of metals, and the improvement of the steam engine. He also referred at some length to the relations between employers and workmen.

Officers were elected as follows: President, E. D. Leavitt, Jr.; Vice-Presidents, John Fritz, Henry Morton, Wm. Metcalf; Managers, Robert W. Hunt, Charles T. Porter, C. J. H. Woodbury; Treasurer, Charles W. Copeland.

The President called for discussion upon papers read at the last preceding meeting, but there was no response.

Among the papers read were the following:

- "Rail Cambering Arrangement of the Lackawanna Coal & Iron Co.," by Wm. K. Seaman.
- "The Protective Value of Boiler Inspection," by F. B. Allen.
- "Supplement to Pumping Engines," also "Back Pressure on Valves," by Prof. S. W. Robinson.
- "The Difficulties of Road Locomotion—Their Causes and Cure," by C. C. Hill.
- "Systematic Preservation of Drawings," by Oberlin Smith.
- "An Adjustable Cut-off for Steam Engines," by H. S. Hayward.
- "Refractory Materials," by Prof. Thomas Eggleston.
- "Launching Ships Side On," by Norman W. Wheeler.
- "A New Indicator," by Prof. J. Burditt Webb.
- "An Account of Certain Tests of the Strength and Stiffness of Large Spruce Beams," by Gaetano Lanza.
- "Technical Schools for Artisans," by Alfred Colin.

The following change in the rules was presented and adopted without discussion, Article XL. to read:

"The Society shall claim no exclusive copyright in papers read at the meetings, nor in reports of discussions, except in the matter of official publication, with the Society's imprint, as its transactions. The Secretary shall have sole possession of papers between the time of their acceptance by the Council and their reading, together with the drawings illustrating the same and at the time of such reading, or as soon thereafter as practicable, he shall have printed copies of such papers, subject to revision, with such illustrations as are needed for the transactions, for distribution to the members, and for the use of technical newspapers, American and foreign, which may desire to reprint them in whole or in part. The policy of the Society in this matter shall be to give papers read before it the widest currency possible, with a view to making the work of the Society known, encouraging mechanical progress, and extending the professional reputation of its members."

A committee was authorized to be appointed by the President to revise the rules of the Society.

A large number of the members were present at the annual dinner. Most of them also joined in excursions to various places of interest in New York and vicinity.

ELECTIONS AND APPOINTMENTS.

Austin & Northwestern.—Mr. J. A. Rhombert, President, is now acting as General Manager also.

Boston, Winthrop & Point Shirley.—The new board has elected John H. Buttrick President; Francis French, Vice-President; Clarence A. Parks, Clerk and General Superintendent; S. W. Hale, Treasurer.

Burlington, Cedar Rapids & Northern.—The following circular is dated Cedar Rapids, Ia., Nov. 1: "Mr. C. D. Ives having resigned his position as Train Master of Second, Third and Milwaukee divisions, to accept the position of Traveling Freight Agent, Mr. G. J. Mohler is hereby appointed as his successor."

Chesapeake, Ohio & Southwestern.—The following order has been issued by General Superintendent Robert Meek:

"Taking effect Nov. 1, the following officers will have charge of the departments named, and their jurisdiction will extend over the entire line, between Louisville and Memphis.

"F. H. Britton, Master of Transportation and Superintendent of Telegraph; headquarters at Paducah. He will have charge of all trainmen, agents, dispatchers, operators, etc. He will direct the movement of trains, as well as cars.

"W. D. Robb, Superintendent of Machinery and Motive Power; headquarters at Elizabethtown, Ky. He will have charge of all machinery and shops, as well as engines and cars; engineers, firemen, car repairers and inspectors will report to him.

"H. S. Heywood, Superintendent of Roadway; headquarters at 258 West Main street, Louisville, Ky. He will have charge of all track, and men employed upon it.

"A. Huntsberry, Superintendent of Bridges, Buildings and Water Stations; headquarters at 258 West Main street, Louisville, Ky. He will have charge of all bridge gangs and water-pumpers, and see that all bridges, stations and tanks are in proper order at all times.

"They will report directly to the General Superintendent, and will be held strictly accountable for the proper conduct of their respective departments. They will appoint such subordinates as may be found necessary, after conference with the General Superintendent. Where it is found necessary to dismiss incompetent men and substitute others in their stead, they will exercise their discretion, bearing in mind that they are looked to for the best possible results, and that they must at all times exercise the greatest economy compatible with efficiency."

Chicago & Eastern Illinois.—Mr. Wm. Gibson has been appointed Car Accountant, with office in Chicago. Car mileage statements will continue to be sent to H. A. Rubidge, Auditor, as heretofore.

Cincinnati, Indianapolis, St. Louis & Chicago.—At the annual meeting in Indianapolis, Oct. 31, the following directors were chosen: George Bliss, C. P. Huntington, New York; Thomas A. Morris, Thomas H. Sharpe, Indianapolis; R. R. Cable, Chicago; M. E. Ingalls, George Hoadly, George Wilshire, S. J. Broadwell, C. W. West, B. F. Evans, Larz Anderson, Cincinnati; J. H. Devereux, Cleveland. There is no change from last year. The board re-elected M. E. Ingalls President; E. F. Osborne, Treasurer.

Cleveland, Mt. Vernon & Delaware.—The following appointments have been made, to take effect on Oct. 30: Mr. J. A. Dew, as Master of Transportation and Superintendent of Telegraph; Mr. R. G. Sharpe, as Chief Train Dispatcher. On and after that date, special orders for the movement of trains will be given by and in the name of the Chief Train Dispatcher.

Credit Valley.—At the annual meeting in Toronto, Ont., Oct. 26, the following directors were elected: G. Laidlaw, E. B. Osler, R. Hay, J. L. Morrison, Wm. Arthur, John Burns, P. D. Conger, W. J. Bains, Chas. D. Rose. The board elected George Laidlaw President, and E. B. Osler, Vice-President.

Fitchburg.—Mr. William W. Welch has been chosen a director in place of C. U. Cotting, resigned.

Hannibal & St. Joseph.—At the annual meeting in Hannibal, Mo., Nov. 6, the following directors were chosen: John Bloodgood, Myron P. Bush, Sidney Dillon, Wm. Dowd, Jay Gould, George J. Gould, Solon Humphreys, Russell Sage, New York; Frederick L. Ames, Boston.

Lackawanna & Pittsburgh.—The directors of this new company are: F. D. Locke, Buffalo, N. Y.; Archer N. Martin, Summit, N. J.; C. H. Clark, T. J. Kimball, J. W. Jones, E. A. Rollins, Philadelphia; Joseph D. Mitchell, J. G. Tuck, Brooklyn, N. Y.; H. A. V. Post, C. C. Pomeroy, Charles E. Kimball, J. W. Galbough, J. D. Reynolds, New York. The officers are: President, Archer N. Martin; Vice-President, H. A. V. Post; Secretary and Treasurer, Charles E. Kimball.

Leavenworth, Topeka & Southwestern.—Mr. J. F. Goddard has been appointed General Freight Agent and Mr. W. F. White General Passenger and Ticket Agent of this company, in addition to their present duties with the Atchison, Topeka & Santa Fe.

Long Island.—Mr. J. R. Maxwell has been chosen Vice-President in place of B. S. Henning, resigned.

Louisville, Evansville & St. Louis.—Mr. J. B. Browning has been appointed General Baggage Agent, with office in Louisville, Ky., to date from Oct. 2.

Manhattan Elevated.—At the annual meeting in New York, Nov. 8, the following directors were chosen: Jay Gould, Cyrus W. Field, Russell Sage, K. M. Gallaway, Edward M. Field, George J. Gould, Sidney Dillon, Samuel Sloan, Jose F. Navarro, W. E. Connor, George S. Scott, John H. Hall, H. F. Dimock.

Metropolitan Elevated.—At the annual meeting in New York, Nov. 8, the following directors were chosen: Sidney Shepard, Joseph S. Stout, Jacob Berry, Elijah Smith, Thomas T. Buckley, Rufus H. Gilbert, Joseph W. Burnham, Morillo H. Gillett, Benjamin W. Gillett, Charles Duggin, Sylvester H. Kneeland. The board elected Sylvester H. Kneeland President; Morillo H. Gillett, Vice-President; John E. Body, Secretary and Treasurer. The new board all belong to the Kneeland or anti-Gould party.

Missouri Pacific.—Mr. B. W. McCullough is appointed Assistant General Passenger and Ticket Agent in charge of business in and from the states of Texas and Louisiana, with headquarters at Marshall, Texas.

New Brunswick.—The officers of this road are now as follows: President, Samuel Thorne; Vice-President, Isaac Burpee; General Manager, E. R. Burpee; General Superintendent, Henry Osburn; Secretary and Treasurer, Alfred Seely; General Freight and Ticket Agent, N. T. Greathead; Train Master, John Stewart; Storekeeper and Purchasing Agent, J. J. Seely. The offices are at Woodstock, N. B., except that of the Vice-President, at St. John, N. B., and the President in New York.

New York & New England.—Mr. Elliot Holbrook is appointed Superintendent of the Western and Springfield divisions and Melrose Branch, vice Mr. T. W. Kennan, resigned, to take effect Nov. 6.

Northern Pacific.—Mr. James F. Jones has been appointed Engineer of Mines and Coal Lands, and will have charge of the company's coal property on the Pacific Coast. He was recently with the Philadelphia & Reading Coal & Iron Company.

Norwich & New York Transportation Co.—At the annual meeting, Nov. 1, the following directors were chosen: F. J. Kingsbury, Waterbury, Conn.; F. H. Dewey, T. B. Eaton, Worcester, Mass.; S. M. Felton, Jr., Wm. F. Hart, James H. Wilson, Boston; Charles W. Copeland, W. Bayard Cutting, R. Suydam Grant, New York. The board re-elected James H. Wilson President; Oliver L. Johnson, Jr., Secretary and Treasurer. The company owns the steamboat line to New York run in connection with the Norwich & Worcester Railroad.

Owensboro & Nashville.—Mr. R. S. Bevier, President, will act as Superintendent also, in place of W. L. Gude, resigned.

Pensacola & Atlantic.—Mr. Colin A. Davies is appointed Principal Engineer and Road-Master to date from Nov. 1, in place of A. W. Closter, Chief Engineer.

Philadelphia, Germantown & Norristown.—At the annual meeting in Philadelphia, Nov. 6, the following managers were chosen for three years: John A. Brown, Jr., Richard Dale, Lewis Elkin, J. W. Johnson, Jr. The road is leased to the Philadelphia & Reading.

Richmond & Danville Extension Co.—The organization of this company is as follows: T. M. Lyon, President, New York; John W. Johnson, Vice-President and General Manager, Atlanta, Ga.; Thomas Seddon, Secretary, New York; W. R. Trigg, Treasurer, New York; H. C. Ansley, Cashier, Atlanta, Ga.; A. B. Johnston, Acting Auditor, Atlanta, Ga.; R. H. Temple, Chief Engineer, Atlanta, Ga.; E. M. Tutwiler, Principal Assistant Engineer, Birmingham, Ala.; Bernard Peyton, Superintendent Land Department, Atlanta, Ga.

Rochester & Pittsburgh.—At the annual meeting in New York, Nov. 8, the following directors were chosen: Walston H. Brown, F. A. Brown, A. Kountze, F. D. Tappen, Andrew Pierce, F. O. French, H. K. Southwick, A. L. Hopkins, James Callery, Henry Day, F. R. Lawrence.

St. Louis & Pacific.—Mr. C. M. Lawler is appointed General Superintendent. He was recently connected with the Wabash, St. Louis & Pacific.

Springfield & Southern.—The directors of this new company are: James C. Conkling, John M. Palmer, Springfield, Ill.; Charles M. Dale, Ira James, Duncan C. McIntyre, Mattoon, Ill.

Terre Haute & Indianapolis (Vandalia Line).—Mr. Joshua Staples, Chief Engineer, having resigned, all communications to that office should be addressed to Joseph Hill, General Superintendent, at St. Louis.

Texas & Pacific.—Mr. Cecil Fleming has been appointed Superintendent of the New Orleans Pacific Division. Mr. Fleming is at present General Superintendent of the Cincinnati, New Orleans & Texas Pacific road (the Cincinnati Southern), and was formerly Assistant General Superintendent of the Mobile & Ohio.

Toledo, Ann Arbor & Grand Trunk.—Mr. J. M. Ashley, President, will act as General Manager also until further notice.

Tonawanda Valley & Cuba and Bradford, Eldred & Cuba.—President R. G. Taylor issues the following special order: "The following appointments have been made, taking effect Nov. 1: C. D. Williams, Superintendent; J. V. D. Loomis, General Freight and Passenger Agent; J. E. Ransom, Auditor, with headquarters at Cuba, N. Y."

Union Pacific.—Mr. E. P. Vining, for a number of years General Freight Agent, has been appointed Freight Traffic Manager, a new office. Mr. P. P. Shelby, late Assistant General Freight Agent, succeeds Mr. Vining as General Freight Agent.

Mr. M. M. Towne is appointed Superintendent of the eating houses, dining and lunch rooms of this road and branches.

Virginia, Tennessee & Georgia Air Line.—Mr. J. M. Bullock, formerly with the Memphis & Little Rock road, has been appointed Contracting Agent of this line, with headquarters at Little Rock, Ark. He will have charge of the business of the line in the state of Arkansas. The appointment dates from Oct. 1.

Western Lines Arbitrator.—The companies composing the Southwestern Railway Association, the Colorado Traffic Association and the Iowa Trunk Lines Association have chosen Arbitrator for the three associations, Mr. C. C. Wheeler, formerly of the Chicago & Northwestern, and now General Manager of the Atchison, Topeka & Santa Fe. Mr. Wheeler has not yet accepted the position.

PERSONAL.

—Mr. W. L. Gude has resigned his position as Superintendent of the Owensboro & Nashville road.

—Mr. C. V. Cotting, long a director of this company, has resigned on account of the pressure of his private business.

—Mr. E. A. Holbrook has resigned his position as General Passenger Agent of the Rochester & Pittsburgh road and will go into other business.

—Mr. Joshua Staples, for a number of years Chief Engi-

neer of the Terre Haute & Indianapolis road (Vandalia Line), has resigned his position, to date from Nov. 1.

—Mr. M. J. O'Brien, for a number of years Passenger Agent of the Cincinnati, Hamilton & Dayton, died at his father's residence in Cincinnati, Nov. 3, of consumption.

—Mr. A. W. Closter, who has had charge of the construction of the Pensacola & Atlantic road as Chief Engineer, retires from that position on the approaching completion of the road.

—Mr. B. T. Lenzard, Local Treasurer of the Mexican Central Railroad in Mexico for two years past, has resigned, to take business charge of a new steam laundry in the city of Mexico.

—Mr. James F. Jones has resigned his position as Mining Engineer of the Philadelphia & Reading Coal & Iron Company, and will go to Washington Territory to take charge of the coal property of the Northern Pacific Company.

—Mr. J. N. Dolph, recently chosen United States Senator from Oregon, is Vice-President and Consulting Attorney of the Oregon Railway & Navigation Company, and has been connected with that company from its first formation.

—It is reported that W. J. Brokaw, Master Mechanic of the Construction Department, Eastern Division of the Northern Pacific Railroad, has resigned to accept a position in charge of the entire Machinery Department of the Utah lines of the Denver & Rio Grande road, with office at Salt Lake City, Utah.

—Mr. Charles Bevington, who has done much acceptable work as a translator for the *Railroad Gazette*, has opened an office at No. 17 Dey street, New York, where he offers his services to inventors, patent attorneys, manufacturers, etc., for searching foreign patents and technical literature, for which a technical education abroad gives him some special qualification.

—Hon. Josiah Quincy, one of the oldest and best known citizens of Boston, died Nov. 3, aged 80 years. He had served in the Boston City Council, as Mayor of the city and as President of the Massachusetts Senate. Mr. Quincy was largely interested in the first construction of several of the older Massachusetts railroads, and was for a number of years Treasurer of the Western Railroad Company, afterwards merged in the Boston & Albany.

—The annual message of the Governor of Georgia, in referring to the Railroad Commission, says: "Before dismissing this subject I feel it to be my duty to ask the General Assembly to take into consideration the recommendation of the Commissioners in regard to the salary of the Secretary of the Commission. Major R. A. Bacon has acquitted himself most creditably in the discharge of his duties as Secretary, both by his ability and industry, and I would add my recommendation that he should receive a salary more commensurate to the amount and character of his services."

TRAFFIC AND EARNINGS.

Grain Movement.

For the week ending Oct. 28 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the seven Atlantic ports have been, in bushels, for the past nine years:

Year.	Northwestern		Atlantic	
	receipts.	Total.	By rail.	By water.
1874.	2,578,641	2,412,374	292,512	12.1
1875.	4,251,118	4,579,686	1,154,484	25.2
1876.	4,308,747	3,902,672	2,351,914	60.3
1877.	5,071,068	3,827,013	587,178	15.3
1878.	4,893,449	4,088,021	905,027	22.1
1879.	7,190,708	4,443,656	1,390,496	31.3
1880.	8,166,032	6,748,761	2,326,182	34.4
1881.	4,400,918	4,264,210	1,886,258	44.3
1882.	6,278,610	3,317,149	1,894,056	57.1

The receipts of the Northwestern markets for the week were 45 per cent. more than last year, and have been exceeded in no corresponding week except in 1879 and 1880. But they were exceptionally large for this fall—1,716,000 bushels more the week before, the largest since August, and exceeded this year in only three weeks.

The shipments of these markets were, however, smaller than in any corresponding week since 1874 and not half as large as in 1880. They were nearly the same as the week before, but with that exception are the smallest since the middle of July.

The rail shipments, however, are larger than last year, and the largest for six weeks. This, in connection with the light seaboard receipts, is an indication that the shipments now are to an unusual extent for consumption at interior points in the East. The shipments down the Mississippi for the week were 186,337 bushels, or 5.6 per cent. of the whole. The lake shipments are not more than half as great as the average in August and September, and not one-third of the average in the fall of 1880.

The Atlantic receipts were smaller than in any corresponding week since 1875; but only 122,000 bushels less than last year, 5,569,000 bushels (61 per cent.), less than in 1880, when they were among the largest ever known. They were 361,000 bushels less than in the previous week of this year, and have been smaller but once since July.

Of the Northwestern receipts, Chicago had 44.7 per cent., St. Louis 19, Peoria 9.2, Milwaukee 9.1, Toledo 9.1, Detroit 6.5, and Cleveland 2.4 per cent. No receipts have been reported at Duluth for two weeks, and probably very little more will be brought there this year, as navigation will soon close, and it is not favorably situated for rail shipments. So far there have been but four weeks this year where receipts at Duluth have had any importance. In those four weeks it received 1,330,306 bushels; in the other 39 weeks of the year, 876,361 bushels. Of the great increase of 1,716,000 bushels in the total shipments over the previous year, Chicago had 1,067,000, St. Louis 259,000, Peoria 172,000. The receipts at Peoria are the largest since August, and with three exceptions the largest since February, caused by large corn and oats receipts, as it receives very little wheat. The corn receipts of the week were extraordinary for this year, and more than twice as great as the week before.

Of the Atlantic receipts for the week New York had 69.6 per cent., Baltimore 13.4, Boston 9.6, Philadelphia 4.9, Montreal 2, New Orleans 0.4, and Portland 0.1 per cent. The notable feature of the week is the very small receipts at Montreal and New Orleans—at the latter place less than 15,000 bushels, against an average of 240,000 in the other three weeks in October. 505,000 in September and 413,000 in August, and at Montreal 69,195 bushels, while its average was 287,000 in the previous three weeks, 339,500 in September and 410,000 in August. The Montreal receipts usually cease (nearly) after the second or third week of November. The small receipts at New Orleans are doubtless accidental. They will probably be larger in the winter than they have been in the fall.

Of the exports of these ports for the week ending Oct. 28, 41.8 per cent. went from New York, 30.2 from Montreal,

15 from Baltimore, 14.1 from New Orleans, 7.3 from Philadelphia, and 1.6 per cent. from Boston.

For the week ending Nov. 2 the exports from these ports were 1,875,756 bushels of grain and 109,877 barrels of flour this year, against 1,898,096 bushels and 39,620 barrels last year, and 5,072,436 bushels and 92,893 barrels in 1880.

For the week ending Nov. 4 receipts and shipments at Chicago and Milwaukee were:

	1882.	1881.	1882.	1881.
Chicago.....	3,737,112	2,252,324	2,724,025	2,223,204
Milwaukee.....	529,004	106,282	253,870	253,795

Both..... 4,266,116 2,358,606 2,977,904 2,477,004

These receipts are, with one exception, the largest of the year, and nearly 40 per cent. more than last year. The shipments were one-sixth more.

At Buffalo for this week ending Nov. 4 receipts and shipments were:

	1882.	1881.	1882.	1881.
By rail.....	492,100	520,500	746,700	715,900
By lake.....	1,153,000	1,021,000	1,030,196	1,742,900

Total..... 1,646,100 2,541,500 1,776,896 2,458,800

The rail receipts were nearly as great as last year; the lake receipts 68 per cent. less. The rail shipments were 4 per cent. more than last year; the canal shipments 40 per cent. less.

For this week ending Nov. 4 receipts at four Eastern ports for three years have been:

Bushels:	New York.	Boston.	Phila.	Baltimore.	Total.
1882.....	197,490	390,250	521,207	3,478,800	3,987,747
1881.....	224,169	350,120	211,250	532,070	3,348,558
1880.....	5,154,085	443,450	792,600	1,139,003	7,529,138

P. c. of total:	1882.	1881.	1880.
1882.....	63.1	10.4	11.5
1881.....	67.1	10.7	6.3
1880.....	68.5	5.9	10.5

Philadelphia and Baltimore together received 26.5 per cent. of the whole this year, against 22.2 last year and 25.6 in 1880. Of the receipts at New York 947,156 bushels (43 per cent.) were by rail this year, against 1,166,167 bushels (52 per cent.) last year. The feature of the receipts at Philadelphia is the sudden and great increase of receipts at Philadelphia. These are more than twice as great as the week before, and more than the aggregate of the three preceding weeks, but yet not large for Philadelphia.

Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending Sept. 30:	1881-82.	1880-81.	Inc. or Dec.	P. c.
Boston & Providence.....	\$1,584,839	\$1,410,313	I.	165,526 11.6
Net earnings.....	352,331	395,403	D.	43,072 10.8
Old Colony.....	4,126,250	3,746,448	I.	379,802 10.1
Net earnings.....	1,305,449	1,246,847	I.	58,602 4.7
Rochester & Pitts.....	305,989	170,593	I.	135,396 79.6
Net earnings.....	101,580	40,987	I.	60,593 147.8

Ten months ending Oct. 31:

	1882.	1881.	Inc. or Dec.	P. c.
Atchison, Top. & S. F.....	\$1,814,821	\$9,822,371	I.	\$1,992,450 20.3
Bur., Cedar R. & No.....	2,276,188	1,824,044	I.	452,144 24.8
Central Iowa.....	956,596	767,789	I.	188,806 24.5
Chi. & Alton.....	6,086,516	6,238,547	I.	447,039 7.2
Chi. & Eastern Ill.....	1,475,232	1,349,865	I.	125,367 9.3
Chi. & Gd. Trunk.....	1,754,122	1,242,781	I.	511,341 41.2
Chi., Mil. & St. P.....	16,351,000	13,601,590	I.	2,749,410 20.2
Chi. & Northwest.....	19,823,849	17,974,656	I.	1,849,193 10.3
Chi., St. P., M. & O.....	4,079,809	3,196,424	I.	883,385 27.6
Col. H. Vy. & Tol.....	2,366,680	1,946,205	I.	420,475 21.5
Denver & R. G.....	5,466,152	4,090,587	I.	1,375,565 33.6
Net earnings.....	2,257,697	1,155,737	I.	1,101,960 95.3
Gulf, Col. & S. F.....	1,142,869	768,693	I.	374,176 48.6
Long Island.....	2,017,602	1,733,002	I.	284,600 16.4
Louisv. & Nash.....	10,552,731	9,131,510	I.	1,421,221 15.6
Metropol. Elevated.....	2,269,527	2,066,027	I.	203,500 9.7
Mobile & Ohio.....	1,581,025	1,881,422	D.	300,397 15.9
N. Y. Elevated.....	2,738,403	2,405,196	I.	333,207 13.6
N. Y. & N. England.....	2,850,930	2,329,115	I.	521,815 22.0
Norfolk & Western.....	1,917,956	1,823,842	I.	94,114 5.2
Northern Pacific.....	3,045,443	1,945,655	I.	1,099,788 56.5
Oregon Ry. & Nav. Co.....	4,213,800	3,565,611	I.	648,189 18.2
Rich. & Danville.....	2,972,500	2,828,193	I.	144,307 5.1
St. L. & San Fran.....	2,911,444	2,587,986	I.	323,458 12.1
St. P. & Duluth.....	887,134	578,790	I.	308,345 53.2
St. P., Clin. & St. L.....	751,402	542,454	I.	208,948 38.7
Union Pacific.....	24,269,556	22,142,546	I.	2,127,010 9.6
Wab., St. L. & P.....	13,880,690	11,789,664	I.	2,091,026 17.7

Nine months ending Sept. 30:

	1882.	1881.	Inc. or Dec.	P. c.
Chi., Bur. & Quincy.....	\$15,053,879	\$15,423,831	D.	\$369,952 2.4
Net earnings.....	6,984,128	7,531,937	D.	547,790 7.3
Month of September:				
Chi., Bur. & Quincy.....	\$2,186,400	\$2,262,981	D.	\$76,581 3.4
Net earnings.....	1,231,858	1,245,633	D.	13,775 1.1
Denver & R. G.....	599,191	208,532	I.	390,659 186.4
Net earnings.....	280,509	208,532	I.	71,977 34.5
Den. & R. G. West.....	39,014	.....	I.	39,014
Net earnings.....	24,417	.....	I.	24,417

Month of October:

	1882.	1881.	Inc. or Dec.	P. c.
Atch., Top. & S. F.....	\$1,402,623	\$1,263,023	I.	\$139,600 11.1
Bur., Cedar Rap. & No.....	306,155	221,748	I.	84,407 38.1
Central Iowa.....	108,464	87,013	I.	21,451 24.5
Chi. & Alton.....	612,032	771,843	I.	159,811 26.0
Chi. & Eastern Ill.....	169,579	156,857	I.	12,722 8.1
Chi., Mil. & St. P.....	2,251,000	1,591,052	I.	659,948 41.6
Chi. & N. W.....	2,592,100	2,341,097	I.	251,003 10.7
Chi., St. P., M. & O.....	585,675	379,028	I.	206,647 54.4
Col., Hock. Vy. & To.....	272,579	247,157	I.	25,422 10.3
Denver & R. G.....	630,598	638,432	D.	7,834 1.2
Den. & R. G. West.....	37,862	.....	I.	37,862
Net earnings.....	21,862	.....	I.	21,862
E. Tenn., Va. & Ga.....	372,235	315,644	I.	56,591 18.0
Evansville & T. H.....	73,408	63,392	I.	10,016 14.3
Ft. Worth & Denver.....	28,287	.....	I.	28,287
Gulf, Col. & S. F.....	227,506	127,421	I.	100,085 78.6
Little Rk. & Ft. S.....	61,592	60,151	I.	1,441 2.4
Little Rk., Miss. R. & T. E.....	39,055	31,455	I.	7,600 24.0
Long Island.....	198,532	163,315	I.	35,217 21.6
Louisv. & Nash.....	1,229,697	1,000,100	I.	229,597 22.0
Metropol. Elevated.....	230,082	223,027	D.	7,055 3.2
Mobile & Ohio.....	265,201	256,924	I.	8,277 3.2
N. Y. Elevated.....	318,737	260,313	I.	58,424 22.4
N. Y. & N. England.....	310,145	261,200	I.	48,945 18.7
N. Y. Tex. & Mex.....	12,291	.....	I.	12,291
Norfolk & Western.....	240,329	267,781	I.	27,452 11.4
Northern Pacific.....	834,460	833,955	I.	505 0.06
Oregon Ry. & Nav. Co.....	507,200	464,732	I.	42,468 9.1
Net earnings.....	288,200	231,153	I.	57,047 24.7
Rich. & Danville.....	436,500	376,300	I.	60,200 16.0
St. L. & San Fran.....	360,900	308,600	I.	52,300 17.0
St. P. & Duluth.....	146,615	73,688	I.	72,927 98.5
St. P., Clin. & St. L.....	92,441	74,560	I.	17,881 23.8
Union Pacific.....	3,158,337	3,169,530	D.	11,193 0.3
Wab., St. L. & P.....	1,565,680	1,397,781	I.	167,899 14.2

Colorado Traffic Association.

At a meeting held in Chicago, Nov. 3, it was decided to change the present pool, so that the two divisions, Northern and Southern, will be abolished, and all the business placed in a general pool. This is done to simplify matters, which it will do in a great degree. The remainder of the day was devoted to a consideration of the new percentages, but no agreement was reached.

On the following day the percentages to be allowed the roads in the Colorado pool east of the Missouri River were first decided upon. They are as follows: Burlington, 27 1/2 per cent; Northwestern, Milwaukee & St. Paul, Rock

Island, Wabash, and Alton, 12 1/2 per cent each, and Wabash, 10 per cent. The Missouri Pacific and Hannibal & St. Joseph are to receive a money consideration for their share of the business. The new arrangement will date from Nov. 1.

Coal Movement.

Anthracite coal tonnages are reported as follows for the ten months ending Oct. 28, the tonnage in each case being only that originating on the line to which it is credited:

	1882.	1881.	Inc. or Dec.	P. c.
Phila. & Reading.....	5,048,006	5,083,072	D.	35,066 0.6
No. Cen., Shamokin D. & Summit Branch R. R. & Sunbury, Hazleton & Wilkesbarre.....	1,043,436	848,895	I.	194,541 22.9
Pennsylvania Canal.....	422,593	388,470	I.	34,123 8.7
Central of N. J., Lehigh Div.....	3,725,338	3,717,964	I.	7,374 0.2
Lehigh Valley.....	4,857,273	4,609,677	I.	247,596 5.4
Pennsylvania & N. Y.....	158,797	80,207	I.	78,590 98.0
Del., Lacka. & Western.....	3,743,977	3,495,487	I.	248,490 7.1
Del. & Hudson Canal Co.....	2,898,548	2,937,714	D.	39,166 1.3
Pennsylvania Coal Co.....	1,169,575	1,145,554	I.	24,021 2.1
State Line & Sullivan.....	50,290	51,233	D.	943 1.8

Total anthracite..... 23,760,141 22,968,089 I. 792,052 3.4

The total anthracite tonnage reported for the corresponding period for eight years has been as follows:

1882.....	23,760,141	1878.....	13,817,359
1881.....	22,968,089	1877.....	14,626,835
1880.....	19,069,128	1876.....	15,976,086
1879.....	21,585,647	1875.....	16,610,626

The increase this year over 1878, when the tonnage was the lightest in the list, has been 9,942,782 tons, or 72 per cent. The increase this year over 1875 was 7,143,515 tons, or 43 per cent.

The coal tonnage of the Belvidere Division, Pennsylvania Railroad for the ten months was as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Coal Port for shipment.....	80,460	62,588	I.	17,872 28.4
South Amboy for shipment.....	610,994	542,475	I.	68,519 12.7
Local points on N. J. lines.....	606,646	582,834	I.	23,812 4.1
Co.'s use on N. J. lines.....	107,835	93,624	I.	14,211 15.2

Total..... 1,405,935 1,281,521 124,414 9.7

Of the total this year 1,167,020 tons were from the Lehigh Region, and 238,915 tons from the Wyoming Region.

Actual tonnage passing over the Pennsylvania & New York road for the eleven months of its fiscal year from Dec. 1 to Oct. 28 was as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Anthracite.....	973,779	979,115	I.	5,336 0.5
Bituminous.....	330,609	383,362	D.	52,753 13.8

Total..... 1,304,388 1,362,477 58,089 4.3

Of the anthracite, the larger part is received from the Lehigh Valley road for shipment west over the Erie.

Semi-bituminous tonnages reported for the ten months are as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Cumberland Region.....	1,061,134	1,757,004	D.	695,870 65.6
Huntingdon & Broad Top.....	233,262	172,076	I.	61,186 35.6
East Broad Top R. R.....	75,308	68,826	I.	6,482 9.5
Tyrone & Clearfield.....	2,296,910	1,966,442	I.	330,468 16.8
Bellefonte & Snow Shoe R. R.....	186,355	98,418	I.	87,937 89.4

Total..... 3,853,059 4,062,766 D. 209,707 5.2

The Clearfield Region has sent out this year more than double the Cumberland tonnage, owing to the loss in the last-named region by the long strike.

Actual tonnage passing over the Huntingdon & Broad Top road for the ten months was as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Broad Top coal.....	233,262	172,076	I.	61,186 35.6
Cumberland coal.....	151,065	200,878	D.	149,813 42.1

Total..... 384,327 432,954 D. 48,627 11.2

The Broad Top coal is mined on the line; the Cumberland carried through for the Pennsylvania Railroad.

The division of tonnage between the three semi-bituminous regions for the ten months was as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Cumberland Region.....	1,061,134	1,757,004	D.	695,870 65.6
Broad Top.....	233,262	172,076	I.	61,186 35.6
Clearfield.....	2,296,910	1,966,442	I.	330,468 16.8

Total..... 3,853,059 4,062,766 D. 209,707 5.2

Cumberland has thus fallen off from 43.2 to 27.5 per cent. of the total. This will be somewhat reduced by the end of the year.

Shipments of Cumberland coal from the mines for the ten months are reported by the Cumberland Coal Association as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Cumberland & Pa. R. R.....	708,442	1,546,852	D.	838,410 54.2
George's Creek & C. R. R.....	127,376	146,434	D.	19,058 13.2
W. Va., Cen. & P. R. R.....	195,208	.....	I.	195,208
Direct to B. & O. from mines.....	30,108	63,718	D.	33,610 52.8

Total..... 1,061,134 1,757,004 D. 695,870 65.6

Shipments away from the region for the same period were as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Baltimore & Ohio R. R.....	738,582	D.	738,582
Bedford Div., Pennsylvania R. R.....	134,349	D.	134,349
Chesapeake & Ohio Canal.....	181,539	D.	181,539

and other valuable works of fiction. The *Railroad Gazette* and the *World*, containing matter of interest to the employees, are received weekly. This room is very largely taken advantage of and with profit to the railroaders who every day appreciate the efforts of the company in their behalf. It is kept scrupulously clean, and the men are compelled to have first visited the wash-room before they can enter it. The sleeping room, in which trainmen from distant points on the division can get rest for an hour or two prior to their return trip, is furnished with ten single beds, which, for comfort, are not equalled in any hospital in the state. The top rooms are not occupied, except as a place of storage for records, etc. The interior of the building is furnished in oiled yellow pine and is decidedly handsome. The gas fixtures are unique and much admired. The outside of the building is attractive and will compare favorably with any structure of its size along the road. R. S. McWilliams, who has been in the employ of the company for 21 years, has charge of the building and takes as much pride in keeping it in order and showing visitors through, as if it were his own individual property."

OLD AND NEW ROADS.

Albion, Carmi & Shawneetown.—This company has been organized to build a railroad from Olney, Ill., southward to Shawneetown on the Ohio, about 85 miles. The office is at Carmi, Ill., and the capital stock will be \$1,000,000.

Allegheny Central.—The proposed extension of this road is to run from the present line near Friendship, N. Y., east to Hornellsville, and thence east by north to Bath, on the New York, Lackawanna & Western. It will be about 38 miles long.

Atchison, Topeka & Santa Fe.—A short coal branch, known as the San Pedro Branch, has been completed from San Antonio, N. M., eastward to Carthage, nine miles. Only freight and coal trains are run over it at present. It is one of several branches to be built under the New Mexican Railroad organization.

Baltimore & Ohio.—At the regular monthly meeting of the board in Baltimore, Nov. 8, the report of the operations of the company for the fiscal year ending Sept. 30, 1882, was submitted and approved, and will be presented at the stockholders' annual meeting. The report was regarded as gratifying, showing the revenues of the company to have been over \$18,000,000. The President stated that the steamship "Le Chatelier," the first of the line to run between Havre and Baltimore, will arrive between the 15th and 20th inst. Another steamer of the same class will follow in a short time. They will connect with the Mediterranean lines and make the fruit trade of that part of Europe a prominent feature of the transportation hitherto. Mr. Garrett also stated that the owners of several important lines in England and the Netherlands have indicated that they will probably promptly form additional lines between Baltimore and European ports.

Boston, Hoosac Tunnel & Western.—The reported sale of a controlling interest in this road to Mr. Vanderbilt has not been confirmed, but the report still continues to circulate.

A Troy dispatch says: "A movement is in progress for the purchase of the Bennington & Rutland Railroad and the Lebanon Springs Railroad by the Boston, Hoosac Tunnel & Western Railway Company, and the consolidation of the three roads mentioned. In case these purchases are made a branch will be built from a point near the present terminus of the Lebanon Springs Railroad to the state line, in order to form a continuous road from Rutland and the north to New York via the Housatonic Railroad, with the probable purchase of the Housatonic road and its incorporation into the Boston, Hoosac Tunnel & Western system. It is said that an agreement has been arrived at by which the Boston, Hoosac Tunnel & Western could acquire title to the Bennington & Rutland Road, but that road is not wanted unless the Lebanon Springs road can be secured. As this road is in the hands of a receiver, an order from the Court directing the sale would be necessary."

Canada Southern.—In anticipation of the increased passenger traffic to follow a closer relation with the Michigan Central, ten new passenger cars have been ordered for this road from the Jackson & Sharp Company, and two dining-cars from the Harlan & Hollingworth Company.

Cedar Rapids, Oskaloosa & Kansas City.—This new company proposes to build a road from Cedar Rapids, Ia., northeast to Anamosa, about 20 miles, and southwest to Oskaloosa, about 70 miles, thence to Kansas City, Mo. The incorporators are: E. H. Gibbs, B. V. Seeyers, W. A. Lindley, J. H. Branch, H. Deffenbaugh, J. J. Snodgrass, F. J. Upton. Office at Cedar Rapids, Iowa.

Chicago & Alton.—The suit brought by the Massachusetts Mutual Life Insurance Company to set aside the foreclosure and sale by which this company acquired the Chicago & Illinois River road, has been settled and all proceedings terminated. It is said that the Chicago & Alton settled the suit by the payment of \$300,000, and that all claims against the Chicago & Illinois River road are withdrawn.

Chicago & Atlantic.—Track is now reported all laid on this road from Marion, O., to the Junction with the Chicago & Western Indiana at Hammond, Ill., 249 miles, except a gap of nine miles near Rochester, Ind. This will very soon be closed, as the grading and bridging is all done.

Chicago, St. Paul, Minneapolis & Omaha.—Track has been laid on the Chippewa Falls & Superior Branch from the junction with the North Wisconsin Division about five miles north of Chandler, Wis., northward 58 miles to Superior City on Lake Superior. This completes a line 166 miles long from St. Paul to Superior City, all over this company's lines.

On the section of this branch from Chippewa Falls to the North Wisconsin junction (which was erroneously reported finished some time ago) track is now laid about 50 miles from Chippewa Falls, leaving 33 miles to be laid to complete the line.

Cincinnati, Indianapolis, St. Louis & Chicago.—At the annual meeting last week the following statement was presented for October and the four months from July 1 to Oct. 31:

	October.	Four months.
Earnings.....	\$250,000	\$963,048
Expenses.....	155,000	575,847
Net earnings.....	\$95,000	\$387,201
Fixed charges, four months.....		226,097
Surplus.....		\$161,104

The usual dividends, at the rate of 6 per cent. yearly, would require \$140,000 for the four months. As compared with the corresponding period of four months in 1881, there was an increase of \$93,630, or 11.4 per cent., in earnings; of \$83,301, or 18.1 per cent., in expenses; and of \$10,329, or 2.7 per cent., in net earnings. The large increase in expenses is due to the fact that the company has charged for

new bridges, track and other extraordinary expenses involved in building the road along Tanner's Creek during the four months over \$100,000.

Columbus & Eastern.—The building of this road has been undertaken by New England parties who are represented by Mr. J. E. Redfield, of Essex, Conn. They have let a contract to Stearns, Norris & Co., who agree to have the road completed by August next from Columbus, O., to the coal fields about Moxahala, a distance of 60 miles. The road will come directly into competition with the Ohio Central.

Corning, Cowanesque & Antrim.—The Cowanesque Valley Branch of this road has been completed to Knoxville, Pa., seven miles west from the old terminus at Elkland, and 18 miles from the main line at Lawrenceville. This branch is just south of and nearly parallel to the New York state line.

Danville, Olney & Ohio River.—In the United States Circuit Court in Springfield, Ill., application was made for the appointment of a receiver for this road. The application came from some of the Boston bondholders, and is opposed by local holders of floating debt claims. It is stated on behalf of the management that the company has about \$775,000 bonds and \$100,000 floating debt, and that the receivership is asked for to prevent vexatious suits and attachments against the property.

Denver & New Orleans.—The grading of this company's branch to Colorado Springs, Col., has been completed and tracklaying is in progress. This branch is seven miles long. Surveys have been completed for the extension from Pueblo to Trinidad, the distance by the line as located being 81 miles. Grading will soon be begun on the section from Pueblo to the Purgatoire.

Denver & Rio Grande.—This company makes the following statement for the ten months ending Oct. 31, the October expenses partly estimated:

	1882.	1881.	Increase.	P. c.
Earnings.....	\$5,466,152	\$4,996,587	\$469,565	9.4
Expenses.....	3,209,115	2,840,800	368,315	13.0
Net earnings.....	\$2,257,037	\$2,155,787	\$101,250	4.7
Net earnings, 1882.....			\$1,129,971	\$2,257,037
Interest on bonds.....			225,102	
Equipment trust.....			200,525	
Taxes, sinking fund, etc.....			1,563,698	
Balance, surplus.....			\$693,339	

The statement says: "The months of November and December are good traffic months in Colorado, and may be expected to add largely to the above net earnings and profit."

In reply to misstatements made about the bonds of this company, the trustees of the mortgages, Messrs. John A. Stewart, President of the United States Trust Company, and L. H. Meyer, have written the following letter to a bondholder, dated at New York, Oct. 28, 1882: "The first mortgage of the Denver & Rio Grande Railway Company was made April 13, 1871, to Messrs. John Edgar Thompson, Samuel M. Felton and L. H. Meyer as trustees. It provided for issuing bonds to the aggregate amount of \$14,000,000. Under it there were countersigned and issued bonds to the amount of \$6,382,500 and no more. On Sept. 12, 1878, the company made a declaration and covenant not to execute or issue any more bonds under that mortgage for any purpose; and on Sept. 14, 1878, I, then sole surviving and remaining trustee, at its request and that of bondholders, executed a like stipulation. The papers were duly recorded in the proper counties, among others in Arapahoe County, on Oct. 29, 1878. On Nov. 4, 1878, copies thereof were deposited with the New York Stock Exchange. It is, perhaps, needless to say that no further bonds have been, will, or can be, executed, authenticated or issued under that mortgage."

"On Jan. 1, 1880, the company made its consolidated mortgage to Mr. John A. Stewart, President of the United States Trust Company, and L. H. Meyer, as trustees. This mortgage provided in all for the issue of \$30,000,000 in bonds, of which bonds to an amount of \$6,382,500 were set apart, and are still reserved unexecuted, to withdraw the above-mentioned first mortgage bonds. In November, 1880, and at a time when the company had issued about \$5,000,000, and contemplated further issues under the consolidated mortgage, it made a deed of further assurance which recited that bonds to the amount of \$10,000,000 more were issued or intended to be issued, under that consolidated mortgage, and, as further security thereby conveyed to Mr. Stewart and L. H. Meyer certain after-acquired properties as additional security upon the trusts in the original consolidated mortgage declared."

East Tennessee, Virginia & Georgia.—It was stated some time ago that this company would build an extension on its Macon & Brunswick Division southward to a point near Fernandina, Fla., for the purpose of securing a share in the Florida travel. It is now said that negotiations are pending for the construction of a branch from the line of that division to Waycross, Ga., and for the use of the Savannah, Florida & Western tracks from Waycross to Jacksonville. The proposed branch would run through a much easier and better country than one along the coast, and there would be much less new road than on the line first proposed.

Framingham & Lowell.—Recently several stockholders of this company made application to the Massachusetts Railroad Commission to enjoin a proposed issue of stock to H. A. Blood and other persons in payment for their services in reorganizing the company and negotiating the lease of the road to the Boston, Clinton, Fitchburg & New Bedford Company (which lease has since been transferred to the Old Colony Company). The claim is that the issue of additional stock is unauthorized, and that the amounts to be paid for services are excessive. A hearing has been in progress before the Commission for several days.

Green Bay, Winona & St. Paul.—It is said that this company will soon begin work on a branch from Blair, Wis., south to Onalaska, about 30 miles. From Onalaska the company owns a track into La Crosse, which it now reaches by using the Chicago & Northwestern track.

It is also reported that a branch will be built from Alma or Merrillan westward to St. Paul, about 120 miles. Surveys for this branch are in progress.

Halifax & Cape Breton.—A dispatch from Halifax, Nova Scotia, Nov. 3, says: "The local government of this province yesterday made a demand upon the Halifax & Cape Breton Railway company to hand over the road known as the Eastern Extension to the Government under an act of the Legislature empowering the government to take the line by Nov. 4, the company to be paid the amount expended by them. The line runs from New Glasgow to Canso. The company claim upwards of \$1,200,000 as the amount of their outlay, but as the government objects to this arbitrators will have to decide in the matter. The company to-day refused to hand over the line. The matter will have to be settled by legislation. The company contends that it should be paid an amount for the road previous to giving it over. The amount cannot

be named at present, as the arbitrators have not made the award."

Illinois Central.—It is stated that there will be a practical consolidation of the management of the Chicago, St. Louis & New Orleans with that of the main line after Jan. 1 next.

Kansas City, Springfield & Memphis.—Track on this road is now laid to Norwood, Mo., 16 miles east by south from the late terminus at Loveland, and 60 miles from Springfield. Work is being pushed forward actively.

Lake Borgne.—A contract has been made with John R. Elder, of Indianapolis, to build and equip this road for \$400,000, the work to be done by July next. It is to be a light standard-gauge road, extending from New Orleans to Shell Beach on Lake Borgne, a distance of 30 miles. At Shell Beach the company will build a wharf and a large hotel, expecting to make the place a summer resort. The new road will follow nearly the line of a railroad built many years ago and afterwards abandoned.

Manhattan Elevated.—A suit has been begun by Attorney-General Russell in the name of the people of the State of New York, and on the relation of Messrs. S. H. Kneeland, Franklin J. Sawyer and Thomas Leighton, against Russell Sage, Jay Gould, Washington E. Connor, Samuel Sloan, Sidney Dillon, Jose F. de Navarro, G. M. Dodge, Cyrus W. Field, the Metropolitan Elevated Railway Company, and others. The object of the action is the removal of the individual defendants from their positions as directors of the company for alleged misconduct and breach of trust. The suit was brought in the Supreme Court, and the place of trial named in the complaint was Monroe County, where one of the relators resides. In their prayer for relief, the relators ask the Court to remove the offending directors from their official positions; to restrain the holding of the election of Nov. 8, and all such elections, "until an election can be held under the supervision of the Court;" to restrain the individual defendants from voting at the approaching election, or from exercising the duties or the powers of directors of the Metropolitan Company; to appoint a receiver of the latter company, its property, estates and franchises, who shall hold the same in his possession until a new election can be had under the supervision of the Court, and to grant temporary injunctions pending the hearing and determination of the suit.

The Manhattan Elevated Railway Company have obtained an injunction restraining the Metropolitan Elevated Railway Company from issuing any certificate out of its stock, or of any share thereof, having thereon a memorandum to the effect that the Manhattan Railway have agreed to pay the Metropolitan Company an amount equal to 10 per cent. per annum on the capital stock of the latter company.

At the Metropolitan annual meeting Nov. 8, an Anti-Manhattan board of directors was chosen.

Marquette, Houghton & Ontonagon.—This company has this season built two short branches to iron mines near its line, one to the Wetmore Mine, one mile long, and one to the Beaufort Mine, 2½ miles long. It has also extended the Republic Mine Branch 5½ miles to the Erie Mine.

Memphis & Charleston.—This road was to be restored to the management of its stockholders Nov. 4, and the lease to the East Tennessee, Virginia & Georgia canceled. Negotiations which have been pending for sometime were settled Nov. 2. The floating debt incurred for improvements by the lessees is about \$800,000, and the East Tennessee finally agreed to accept \$300,000 of the Memphis & Charleston first-mortgage bonds at 120 and the balance in cash, in payment for the said floating debt and for the bonus of \$400,000 for which it agreed to surrender the lease; these payments were to be made Nov. 4. It is understood, however, that the payments were not made on that day, and the lease consequently remains in force.

Mexican National.—The extension of this road beyond Monterey, Mexico, is now completed to Santa Catarina, the first train reaching that town Nov. 3.

Nashville, Chattanooga & St. Louis.—A Washington report says: "The Solicitor of the Treasury is considering an offer of compromise from this company in the suit against it by the government to recover \$153,000 and interest for coupons on bonds purchased 20 years ago, which have never been paid, for the reason that the coupons were supposed to have been lost. The amount offered by the agents of the road is \$125,000, which they urge is ample, considering the fact that they were deprived of the use of their road for four years by Confederates, and that the government never demanded payment until about two years ago. These coupons belong to the bonds purchased with the Cherokee Indian funds at the beginning of the war, which amounted to about \$500,000. The Confederates took possession of the road shortly afterward, and all dealings were, of course, suspended for about four years. At the end of this time the coupons in question had disappeared, and no one in the Treasury Department knew what had become of them until they were found about two years ago."

New York Central & Hudson River.—A dispatch from Washington, Nov. 6, says: "A decision was rendered by the Supreme Court of the United States to-day in the internal revenue tax case of John M. Bailey, Collector, against the New York Central & Hudson River Railroad Company, brought here by writ of error to the Circuit Court of the United States for the Northern District of New York. This was a suit to recover the sum of \$550,172.60, paid under protest by the railroad company, as a tax, under the Internal Revenue act of 1864, upon certain interest certificates issued by the company to its stockholders, Dec. 19, 1868. Upon trial of the case below, the Circuit Judge instructed the jury that these interest certificates were not scrip dividends within the meaning of the internal revenue law, and that the issue of them was not a transaction which subjected the company to any tax; that the tax was erroneously assessed, and that the Collector must pay the amount realized by his proceedings. Under this instruction the jury rendered a verdict in favor of the company for the full amount claimed, and judgment was entered accordingly. Upon appeal to the United States Supreme Court this judgment was reversed and a new trial ordered upon the ground that the interest certificates did not constitute a scrip dividend and were properly liable to tax. The second trial in the Circuit Court resulted in a verdict and judgment in favor of the railroad company for \$499,432.68, the Court instructing the jury that while the certificates constituted a scrip dividend which justified the assessment and constituted a complete *prima facie* defense to the action, nevertheless it was competent for the railroad company to show what amount of its earnings accruing between Sept. 1, 1862, and Dec. 19, 1868, were represented by and included in these certificates; and since this amount alone was subject to the tax, the railroad company was entitled to recover all in excess of it which had been exacted and paid. In reviewing the case a second time, this Court sustains the instruction of the Circuit Judge to the jury as above set forth, and says that the tendency and effect of the proof thus admitted were to exact from the company the full tax upon every

dollar of its earnings which had not previously paid its proper assessment and which, in any form, was subject to taxation, and to relieve it only to the extent to which otherwise it would have been subjected to the payment of a second tax upon the same fund. The result and the process by which it was reached seem, in the opinion of this Court, to conform strictly both to the letter and the spirit of the law governing the subject. The judgment of the Court below is therefore affirmed, with costs and interest. Opinion by Judge Matthews, Justice Harlan dissenting."

New York, Chicago & St. Louis.—The Illinois Central Company has refused to allow the trains of this company to come up to the temporary station on Randolph street in Chicago, and some new arrangements will have to be made for terminal facilities in that city.

Nothing further has been made public as to the real purchasers of the stock of the company, who are represented by Messrs. Devereux and Burke. Those gentlemen have been interviewed, but, while they are perfectly willing to talk, they decline to tell anything. The general opinion still is that, however the purchase may be covered up, Mr. Vanderbilt is the real owner, and that the road has been bought to protect the Lake Shore.

The payments required on the purchases of stock made have been promptly met. It is understood that Messrs. Devereux and Burke will be chosen directors soon, but that no other changes will be made.

New York, Pennsylvania & Ohio.—A dispatch from London, England, Nov. 2, says: "The report of Messrs. Allport and Swarbrick to the bondholders of the New York, Pennsylvania & Ohio Railroad Company recommends that negotiations be opened with the New York, Lake Erie & Western Railroad Company for a pooling arrangement, by the terms of which each company shall receive profits proportionate to its mileage, and shall contribute, also proportionately, to the working expenses. In case of a failure to make an arrangement with the New York, Lake Erie & Western Company, the report recommends the extension of the line so as to obtain a portion of the seaboard traffic and a partial combination with other roads going to Cleveland, in order to destroy the present ruinous competition and effect a gradual raising of rates. The docks and machinery for discharging iron ore at Cleveland should also be extended and a freehold be purchased on the expiration of the lease of the Cleveland premises. The local service should be improved by running additional passenger cars. Messrs. Allport and Swarbrick had interviews with President Jewett and Mr. Vanderbilt. The former expressed his willingness to negotiate for a pool. The latter is willing to arrange for through service with Western towns, but refuses any fusion scheme between this company and the New York Central."

The report also recommends that the company have equal rights and powers with the New York, Lake Erie & Western Company in existing lines and any that the latter company may become interested in, the two lines to be considered integral portions of the same system. A pooling arrangement is recommended, if absolute fusion is not feasible. The agreement should be for a long term, both companies binding themselves not to enter into any agreement injurious to the other. Messrs. Allport and Swarbrick further state that of possibly \$72,500,000 by which the capital has been increased since 1870, they could only trace \$8,500,000 which by any possibility could have added to the value of the property, the remainder having been consumed in bonuses, discounts, capitalized interest, and every other variety of financial device for meeting liabilities by increasing the amount of indebtedness. The delegates objected to the report being read until a resolution was passed empowering the Committee to pay them \$10,000, out of the first moneys received. They said they had been offered \$5,000 for the report in America."

Norfolk & Western.—Track on the New River Division is now laid to Glenlyn, Va., at the mouth of East River, 38 miles from the main line at New River station. The 36 miles from Glenlyn to the terminus of the division at Pocahontas are all graded, and the track will be laid by the company itself. Coal mining and preparations for coke making at Pocahontas and in the vicinity are being vigorously pushed.

Northern Pacific.—Track is now laid for 30 miles west from the late terminus at Merrill, Montana, and 993 miles from St. Paul. The winter terminus will probably be at Livingston, the last crossing of the Yellowstone. Trains now run to Merrill.

On the Fargo & Southwestern Branch track is now laid from Fargo, Dak., to Sheldon, 40 miles, and will be completed this season to Lisbon, 15 miles further.

It is stated that an agreement has been concluded with the St. Paul, Minneapolis & Manitoba Company for a division of territory in the Red River Valley, where the two roads intersect. This will involve an exchange of, two or three branches, and in some cases the use of tracks in common.

Ohio Central.—This company has given notice of an increase of capital stock from \$20,000,000 to \$22,000,000. The company's bonded debt is \$7,200,000, including \$3,300,000 income bonds.

Pennsylvania, Slatton & New England.—Work on the bridge over the Delaware at Portland, Pa., has been stopped, and several attachments have been put on the property there and elsewhere. It is said that the trouble results from the failure of the company and the general contractors to make payments to the sub-contractors as agreed on.

Pittsburgh & Western.—Good progress has been made in the improvement of the old line, cutting down grades, reducing curves, etc., and laying the third rail for standard gauge between Allegheny, Pa., and Chewton.

From Chewton to New Castle, 10 miles, the track is all laid and the road completed except one bridge, which is now being erected.

On the Parker Division, which is to remain narrow-gauge, the connecting line of 14 miles from Duck Run, or Callery Junction as it is now called, is finished. Track is also laid from Parker, the old terminus of the division (formerly the Parker & Karns City road) along the Allegheny River four miles to Foxburg, completing the connection with the Pittsburgh, Bradford & Buffalo road.

Rochester & Pittsburgh.—The Buffalo Express of Nov. 7 says: "When General Manager Merchant, of the Rochester & Pittsburgh Railroad, was in Buffalo a day or two since, he succeeded in making arrangements with the Buffalo Creek Railroad Company, whereby the trains of the Rochester & Pittsburgh will, for the present at least, enter the city on the Creek tracks. The road-bed of the Rochester & Pittsburgh is finished for a considerable distance within the city limits, but from the connection with the Creek road the latter will be used. While the matters of terminal facilities and depots are yet unsettled, this arrangement with the Buffalo Creek Railroad Company opens to the new comer a direct entrance to the heart of the city, and probably to coal and dock privileges, which it will so much need. From the junction with the Buffalo Creek road the freight

brought in over the Ashford Branch of the Rochester & Pittsburgh will be distributed."

St. Louis, Iron Mountain & Southern.—The grading of the branch to Doniphan, Mo., is now nearly completed, the bridges are being erected, and tracklaying has been begun. The branch will be about 20 miles long.

St. Louis & San Francisco.—On the Arkansas Division track has been laid to Van Buren, Ark., 21 miles southward from the late terminus at Mountainburg, 129 miles from the junction with the main line at Plymouth, Mo., and 414 miles from St. Louis. Regular trains will run to Van Buren in about a week. Work has been begun on the bridge over the Arkansas River and the extension to Ft. Smith, six miles beyond Van Buren.

The Springfield Southern Branch is now completed to Ozark, Mo., 16 miles south of Springfield, and has been opened for traffic. Grading is in progress south of Ozark.

St. Paul, Minneapolis & Manitoba.—The Pelican Branch, from Fergus Falls, Minn., to Pelican Rapids, 32 miles, has been transferred by the Northern Pacific to this company.

The New York Times of Nov. 6 says: "Vice-President Oakes, of the Northern Pacific Railroad, said yesterday that it was true that his company had effected an adjustment with the St. Paul, Minneapolis & Manitoba Railroad of the territory in which the two companies are represented. The Northern Pacific was an east and west system, and the Manitoba a north and south system. Each had two branches that extended directly into the other's domain, and the roads were turned over by one company to the other. The Northern Pacific transferred 110 miles and the Manitoba 100. In the settlement the Northern Pacific received \$1,500,000 from the Manitoba, and it was agreed that such lines as could not be disposed of in the way that the others were should be used in common. The roads surrendered by each company were in direct opposition to the main line of the other, and Gen. Oakes said the effect would be to harmonize the two interests."

South Pennsylvania.—Surveys have been completed for this proposed road from Harrisburg, Pa., by Burnt Cabin in Fulton County, Bedford and Somerset to the Youghiogheny at the mouth of Jacob's Creek. From that point a line is to run to Wheeling, W. Va.; for Pittsburgh a connection will probably be made with the Pittsburgh, McKeesport & Youghiogheny road. It is claimed that the maximum grade in each direction will be 52.8 ft. per mile, except the ascent of the eastern slope of the Allegheny Mountains, between Bedford and the summit, where 68 ft. per mile is used. The distance from the Susquehanna to Wheeling will be about 266 miles.

Springfield & Southern.—This company has been incorporated to build a railroad from Springfield, Ill., south, to a point on the Mississippi near Grand Tower, with a branch to East St. Louis.

Trinity & Sabine.—Track on this road has been extended from the late terminus at Moscow, Tex., east five miles, making the road 43 miles long from Trinity. Grading is nearly finished to Forin, 25 miles further.

Union Pacific.—The Greeley, Salt Lake & Pacific road, which is owned and operated by this company, is now open for business from Greeley, Col., westward to Stout, 39 miles. It is worked as a branch of the Colorado Division.

Wabash, St. Louis & Pacific.—This company has begun to run through trains between St. Louis and Des Moines, Ia., over its new Des Moines Division.

Western Union Telegraph.—The New York Superior Court at General Term has decided that this company had no power, after increasing its capital stock, to distribute among its stockholders part of the additional stock. This decision was rendered in the suits of William S. Williams and Rufus Hatch against the Western Union Telegraph Company, the American Union and Atlantic & Pacific Telegraph Companies, the Union Trust Company and Jay Gould and others, individually and as Directors of the Western Union Company. The suits were brought to have the agreement of Jan. 19, 1881, made for the purchase by the Western Union of the property and franchises of the American Union and Atlantic & Pacific Telegraph Companies, set aside as invalid and fraudulent. This agreement provided for the increase of the Western Union's capital from \$40,000,000 to \$80,000,000, and for the payment of about \$24,000,000 of its new stock to the stockholders of the two other companies. The remainder of the new stock—\$15,526,590—was agreed should be divided among the then holders of Western Union stock. The plea upon which this distribution was to take place was that annually for 15 years a part of the earnings of the Western Union had been invested in new plant and that the stockholders, who had been deprived of this money, were entitled to receive its equivalent in stock. The Union Trust Company was made the medium for the distribution of the stock, but that distribution was prevented by injunctions granted by Chief Justice Sedgwick in the Williams suit and by Judge Speir in the Hatch suit. Both actions were tried before Judge Truax in Superior Court, Special Term, and he gave judgments for the defendants, holding that all they had sought to do under the so-called agreement of consolidation was within the law.

The General Term now reverses Judge Truax's decisions, and orders new trials of the suits, holding that, while the company's right to purchase the property of the other companies and issue stock for the same cannot be denied, yet the construction to be given to the statute forbidding the declaration of dividends, except from surplus profits, and prohibiting the division, etc., of capital without the consent of the Legislature being so stated, and no such consent having been found to exist, the plaintiff has demonstrated that the proposed gratuitous division of \$15,526,590 of stock among the shareholders of the Western Union Company is wholly illegal. No action on the part of directors or stockholders, or both combined, could overcome this difficulty, and as the illegality complained of entered into and permeated the agreement of Jan. 19, 1881—inasmuch as by its terms the capital stock of the Western Union Company was to be first diluted to the extent of the proposed gratuitous issue, and payment for the property rights and franchises of the vendor companies to be made in the stock thus depreciated, the agreement itself cannot be sustained.

Winchester & Potomac.—The stockholders of this company have voted to authorize the issue of second-mortgage bonds to an amount sufficient to fund the floating debt. The bonds are to bear 5 per cent. interest, have 20 years to run, and are not to be sold for less than par. The road is leased to the Baltimore & Ohio.

ANNUAL REPORTS.

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Central of New Jersey.....264	Norfolk & Western.....55
Central Pacific.....217, 644	Northeastern (S. C.).....55
Central Vermont.....645	Northern Central.....125
Charlotte, Col. & Augusta.....23	Northern (New Hampshire).....344
Chesapeake & Ohio.....157, 189	Northern Pacific.....596
Chesapeake & Ohio Canal.....420	Ogdensburg & L. Champlain.....386
Cheshire.....324	Ole Central.....569
Chicago & Alton.....141	Ohio & Mississippi.....655
Chicago, Bur. & Quincy.....317, 323	Ohio Southern.....406
Chicago, Mil. & St. Paul.....175, 296, 296	Oregon & California.....404
Chicago & North Western.....490, 497	Oregon Ry. & Nav. Co.....486, 691
Chicago, Rock. & Pacific.....316, 420	Oregon & Transcontinental Co.....142
Chicago, St. P. Minn. & Om. 190, 279	Pacific Mail Steamship Co.....370
Cin., Hamilton & Dayton.....870	Panama.....217
Cin., Ind., St. L. & Chi., 386, 516, 599	Pennsylvania Company.....563
Cin., N. Ohio & Ind. Pac. 71	Pennsylvania & N. Y.....157
Cleve., Col., Cin., Indianapolis.....265	Pennsylvania & Ohio.....157
Cleve., Tuscarawas Vy. & Wb.....190	Pensacola & Atlantic.....246
Columbia & Greenville.....7, 637	Pensacola & Perdido.....324
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Conn. & Passumpsic Rivers.....590	Petersburg.....190
Connecticut River.....70	Philadelphia & Reading.....7, 30
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Croft & Grand Haven & Mil.....142	Pittsburgh & Castle Shannon.....142
Delaware.....54	Pittsburgh, Cincinnati & St. L.....206
Delaware & Hudson Canal.....101, 176	Pittsburgh & Lake Erie.....93
Delaware, Lacka. & West.....71	Portland & Ogdensburg.....90
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Delaware Western.....41	Providence & Worcester.....246
Denver & Rio Grande.....71, 314	Pullman's Palace Car Co.....589
Des Moines & Ft. Dodge.....101	Queen Anne's & Kent.....396
Det. & Grand Haven & Mil.....142	Richmond, Fred. & Potomac.....216
Detroit, Lansing & No.....406	Rochester & Pittsburgh.....142
Eastern R. R. Association.....281	Ruby Hill.....324
Eureka & Palisade.....324	Rutland.....483
Excelsior.....40	St. Johnsbury & Lake Champlain.....510
Flint & Pere Marquette.....523	St. Alton & Terre Haute.....440
Galveston, Har. & San Antonio.....466	St. Louis & San Francisco.....117
Georgia & Alabama.....340	St. L. Vandalia & Terre Haute.....484
Grand Rapids & Indiana.....324	St. Paul & Duluth.....217
Grand Trunk.....222	St. Paul, Minn. & Manitoba.....190
Great Western.....280	Sandy River.....190
Hannibal & St. Joseph.....176	Savannah, Florida & West.....217
Han. J'n., Hanover & Gettysburg.....324	South Carolina.....189
Hartford & New Haven.....142	South Carolina Minor R.R.s.....7
Houston.....195	Southern Pacific.....450
Houston, East & West Texas.....190	Sussex.....386
Houston & Texas Central.....126	Terre Haute & Indianapolis.....483
Huntingdon & B'd. Top Mt.....101	Terre Haute & Logansport.....484
Illinois Central.....96, 125	Texas & Pacific.....484
Indiana, Bloomington & West.....402	Troy & Greenfield.....70
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Iowa Minor Railroads.....71	United New Jersey.....149
Junction & Breakwater.....349	U. S. Rolling Stock Co.....185
Kan. City, Ft. Scott & Gulf.....310	Utica & Black River.....70
Kan. City Lawrence & So. Kan.....483	Vermont Valley.....403
Kentucky Central.....195	Vicksburg & Meridian.....450
Kin. 142	Virginia Midland.....440
Lake Erie & Western.....675	Virginia & Truckee.....160
Lake Shore & Mich. So.....271, 279	Wabash, St. L. & Pacific.....194, 218
Lehigh Coal & Navigation Co.....126	Western Maryland.....7, 675
Little Rock & Ft. Smith.....310	Western R. R. Association.....54
Long Island.....71	Western Union Telegraph.....100
Louisville, Cin. & Lexington.....71	West Jersey.....622
Louisville & Nashville.....622, 627	Wilmington & Northern.....439
Louisville, New Alb. & Chi.....142	Worcester & Nashua.....55
Manchester & Lawrence.....340	Wisconsin Central.....370

Boston & Providence.

This company owns a main line from Boston to Providence, 44 miles, all double track; the West Roxbury Branch, 5.37 miles; the Dedham Branch, 2.22 miles; the Stoughton Branch, 4.11 miles, and the India Point Branch, 8.05 miles, making 63.75 miles owned. It leases the Attleboro Branch, 4 miles, making 67.75 miles worked. The report is for the year ending September 30.

The company controls the Providence, Warren & Bristol road, but does not work it.

The general account is as follows:

Stock.....	\$4,000,000.00
Funded debt.....	800,000.00
Bills, accounts and balances.....	84,087.93
November dividend.....	160,000.00
Profit and loss.....	440,060.19
Total.....	\$5,444,154.12
Road, etc.....	\$4,868,174.38
Stocks.....	231,269.42
Notes and accounts.....	250,802.54
Materials.....	129,543.34
Cash.....	36,304.44
	5,544,154.12

The funded debt consists of \$500,000 non-mortgage bonds and \$360,000 long notes. Of these the \$500,000 bonds bear 7 per cent., \$160,000 notes bear 5 per cent., and \$100,000 bear 4 per cent. Last year \$100,000 of 7 per cent. notes fell due, and were renewed at 4 per cent.

The traffic for the year was as follows:

	1881-82.	1880-81.	Increase.	P. c.
Train miles.....	888,707	865,216	23,491	2.7
Passengers carried.....	4,128,290	3,802,405	325,884	16.6
Passenger-miles.....	46,344,791	42,191,736	4,153,055	9.8
Tons freight moved.....	718,500	660,200	58,300	8.8

The increase in traffic was very considerable, especially in local passengers.

The earnings for the year were as follows:

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Passengers.....	\$810,763	\$822,751	\$11,988	1.0
Freight.....	605,221	533,957	71,264	13.2
Other.....	68,855	62,605	6,250	10.0

Total.....	\$1,584,839	\$1,419,313	\$165,526	11.6
Expenses.....	1,232,509	1,023,910	208,599	20.4

Net earnings.....	\$352,330	\$395,403	D. \$43,073	10.9
Gross earn. per mile.....	23.390	20.649	2.741	13.6
Net earn. per mile.....	5.200	5.836	D. 636	10.0
Per cent. of exps.....	77.76	70.72	7.04	...

The very considerable increase in earnings was more than equalled by that in expenses, the result being a decrease in net earnings.

The income account was as follows:

Net earnings.....	\$352,330.74
Balance of interest account.....	\$22,816.17
Dividends, 8 per cent.....	320,000.00
	342,816.17
Surplus.....	\$9,514.57

The report of the President says:

"Two dividends of 4 per cent. each clear of taxes have been earned and declared. The dividends on investments in the Union Freight Railway and the preferred stock of the Providence, Warren & Bristol Railroad have been credited to interest account. The increase of expenditures will naturally attract attention. That a comparison may be made between the outlays of this year and the last, they have been set forth in parallel columns in the Treasurer's tables. The increase has been chiefly due to the increase of mileage, higher taxation, renewals, repairs and additions to property. Taking advantage of the larger receipts, many improvements heretofore delayed have been forwarded. Small parcels of land have been purchased in Providence, Pawtucket, Readville, Roxbury and Boston. At Pawtucket, a freight house,

greatly needed, and at Dedham a new passenger station and locomotive house, have been finished and occupied. An iron highway bridge has been built at Canterbury street in Roxbury, rendered necessary by the extension of the third track. The heavy ledge of rocks near by has been removed. Next year the third track will be completed from Mt. Hope to Readville, and put in operation as soon as practicable. The main drawback in this undertaking is a highway bridge at Hyde Park, where we still await the action of the town and Norfolk County Commissioners. Electric signals have been operated with success between Providence and Pawtucket, and additional electric warning signals have been placed at different stations and crossings. Forty freight cars of various descriptions, seven passenger cars and four locomotives have been bought, to which is to be added a small ownership in 10 new Wagner sleeping and drawing-room cars. At Boylston station the road-bed has been made solid, with the exception of a conduit for drainage. All the above improvements and additions to rolling stock and property have been charged directly to expense account. The main line is now entirely equipped with steel, and there are 12 miles of steel rails in the branches. On the 18th of September last a hearing was given to petitioners for lower fares between Boston and the suburban stations. This subject has been repeatedly under consideration. The directors have no doubt that some modification in rates should be made to certain points on and after Jan. 1 next. As yet no definite methods have been adopted. The terminal facilities of the railways which centre in Providence have long been unequal to the travel and business of that constantly growing city. Early in May, 1881, this corporation in connection with the Providence & Worcester Railroad Company, asked the city government for an additional grant of land, with a view to obtaining better accommodations for other roads as well as their own. The result of our application was the appointment of a commission consisting of influential citizens serving without pay, to consider the whole matter and to present some comprehensive plan. This led to a report. In the opinion of experts, the adoption of the original scheme of the commissioners would have been attended by too great cost. It is hoped that within a brief period the different roads interested will be able to agree upon such plans as will receive the approval of the commissioners and be satisfactory to the city government of Providence.

Rome, Watertown & Ogdensburg.

The following brief statement is published for the year ending Sept. 30 last:

Earnings.....	\$1,819,766
Expenses.....	1,385,426
Net earnings.....	\$434,340
Interest and sinking fund.....	\$253,090
Rentals.....	32,750
Surplus for the year.....	\$148,491
Balance from previous year.....	2,551
Balance, Oct. 1, 1882.....	\$151,042

Expenses were 76.12 per cent. of gross earnings. The statement shows a considerable improvement over the previous year.

Chicago & Eastern Illinois.

At the close of its last fiscal year, June 30, 1882, this company worked a main line from Dalton, Ill., to Danville, 107.5 miles, with an extension from Danville to Sidell's Grove, 28 miles, and a branch from Covington, Ind., to Coal Creek, 10.5 miles. It leased the Indiana Block Coal road, from Otter Creek to Brazil, Ind., 14 miles; the Evansville, Terre Haute & Chicago, from Danville to Terre Haute, 55 miles; the Strawn & Indiana State Line, from Wellington to Cissna Park, 13 miles; the use of the Chicago & Western Indiana, from Dalton to Chicago, 17 miles, and of the Indiana, Bloomington & Western, from Danville to Covington, 13 miles, making a total of 258 miles worked. The following statements are from the President's report as presented at the annual meeting:

The equipment consists of 56 engines; 15 passenger, 8 baggage and 3 mail cars; 713 box, 104 stock, 20 flat, 2,197 coal and 23 caboose cars; 1 pay and 6 service cars.

The earnings of the year were as follows:

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Freight.....	\$1,337,558	\$1,252,708	I. 84,790	6.8
Passengers.....	272,511	204,848	I. 67,663	33.0
Mail, etc.....	82,198	76,794	I. 5,404	7.0
Expenses.....	\$1,692,267	\$1,534,410	I. \$157,857	10.3
Net earnings.....	\$693,444	\$497,332	I. \$196,092	39.0
Gross earn. per mile.....	6.994	7.394	D. .390	3.3
Net " " ".....	2.832	2.335	I. .497	21.3
Per cent. of exps.....	50.02	67.59	D. 8.57	...

A large increase in earnings was accompanied by a small reduction in expenses, making a very considerable increase in net earnings.

The earnings and expenses were divided as follows last year:

	Earnings.	Expenses.	Net earnings.
Main line and branches.....	\$1,310,441	\$765,133	\$545,308
Ev., T. H. & Chi.....	381,826	233,090	148,736
Total.....	\$1,692,267	\$998,223	\$693,444

The rental paid for the Evansville, Terre Haute & Chicago road, including taxes and use of tracks of the Evansville & Terre Haute road at Terre Haute, amounted to \$95,346, showing a profit on the lease of \$49,790, against a loss in the preceding year.

The rental paid for the entrance into Chicago over the Chicago & Western Indiana was \$62,163, and for the use of the South Chicago Branch, \$5,830.

The income account for the year was as follows:

Net earnings, as above.....	\$693,444
Taxes.....	330,359
Interest on bonds.....	227,080
Rentals.....	169,194
Interest and discounts.....	17,681
Dividends.....	89,931
Surplus for the year.....	\$159,190

Expenditures on account of construction were \$67,890, and for new equipment \$247,165, a total of \$314,564, or \$155,374 more than the surplus of income remaining for the year.

The report says: "The new machine shop at Danville has been completed and is now in use."

"The freshets during the past winter having rendered some of the bridges insecure, it has been necessary to strengthen and partly rebuild some of them; it is also thought advisable to build stone abutments at an early date for such bridges as are not so provided."

"The work of reducing the grade of the road has steadily progressed, and it is expected that expenditure in this direction will terminate during the next fiscal year."

"The Grape Creek Extension has been completed to Sidell's Grove, and is now operated. A junction has been made with the Danville, Olney & Ohio River at this point. A considerable amount of freight may be looked for from this line, as well as rental from use of tracks."

"By the advice of the board of directors, the company has assisted the Strawn & Indiana State Line Railroad in building about 13 miles of road from Cissna Park to Wellington Junction, on the line of this road. This branch is now completed, and is operated by the Chicago & Eastern Illinois. As it intersects one of the best corn sections of the state of Illinois, a fair amount of business may be expected from it."

"The tracks of the Coal Creek Branch of the road have been extended 1 1/4 miles for the purpose of reaching some newly-opened mines. The general coal business has suffered from strikes, both of the miners and the ironworkers, but a large demand will probably set in later in the year."

In relation to the litigation over the Chicago, Danville & Vincennes foreclosure, it is claimed that the most valuable part of the company's property cannot be affected in any event.

Mobile & Ohio.

This company owns a main line from Mobile, Ala., to East Cairo, Ky., 498 miles, with branches to Columbus, Miss., 14 miles; to Starkville, Miss., 11 miles; to Aberdeen, Miss., 9 miles; a total of 527 miles, of which 280 miles are laid with steel. There are 49 miles of sidings. The road was increased during the year by the opening of the extension from Columbus, Ky., to East Cairo, 21 miles. The report is for the year ending June 30.

The equipment consists of 75 engines; 28 passenger, 10 baggage and mail, and 6 express cars; 757 box, 150 stock and 320 flat cars; 2 special and 80 service cars. Of these 3 passenger, 57 box and 10 stock cars are held under a car trust.

The general account is as follows:

Stock.....	\$5,320,600.00
Funded debt.....	16,250,000.00
Current accounts and balances.....	181,114.20
Equipment debt.....	50,405.47
Profit and loss accounts.....	308,317.33
Total.....	\$22,170,437.00
Road and equipment.....	\$20,812,281.40
Land Department.....	617,153.79
Sinking fund.....	200,500.00
Current assets and accounts.....	490,096.34
Car trust.....	50,405.47
Total.....	\$22,170,437.00

Current assets and accounts include materials charged at \$325,831.12, and \$40,428.32 cash. The funded debt includes \$7,000,000 first-mortgage 6 per cent. bonds; \$600,000 Cairo Extension bonds, and \$8,650,000 in 7 per cent. debentures, \$5,300,000 being first-preferred, \$1,850,000 second-preferred, \$600,000 third-preferred and \$900,000 fourth-preferred.

The Land Department reports for the year sales of land and town-lots amounting to \$52,005.25. The total receipts, including \$16,351.69 balance from previous year, were \$119,333.95; expenditures for expenses, etc., \$15,864.51, and for purchase of first-preferred debentures, \$65,031.87, a total of \$80,896.38, leaving a balance of \$38,437.57, of which the sum of \$9,660.99 is in cash, and \$28,776.58 in land contracts. There are \$200,500 in first-preferred debentures on hand, of which \$68,500 were bought last year. The unsold lands include 1,143,342 acres valued at \$540,705, and town-lots valued at \$27,107.

The traffic for the year was as follows:

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Train miles.....	1881-82.	1880-81.	Inc. or Dec.	P. c.
Passenger.....	418,704	382,154	I. 36,550	9.5
Freight.....	737,015	809,987	D. 72,972	9.0
Service and switching.....	337,583	330,303	D. 7,280	0.5
Total.....	1,493,302	1,513,444	D. 20,142	2.5
Passengers carried.....	303,952	250,080	I. 44,272	17.0
Passenger-miles.....	12,409,125	11,312,655	I. 1,096,470	9.7
Tons freight carried.....	345,755	364,411	D. 18,656	5.1
Ton-miles.....	75,184,535	80,950,914	D. 11,772,379	13.5
Av. train load.....	30	30		
Passengers, No.....	102	107	D. 5	4.7

The average passenger journey was 40.8 miles; the average freight haul, 217.4 miles. Of the passenger miles 23.3 per cent. were of through passengers. Of the ton-miles 40.2 per cent. were of north-bound and 59.8 per cent. of south-bound business. The cotton carried was 232,230 bales, against 230,949 bales the previous year.

The earnings for the year were as follows:

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Freight.....	\$1,617,432	\$1,791,503	D. \$173,571	9.7
Passengers.....	401,702	416,127	D. 14,425	3.5
Mail and express.....	77,980	83,335	D. 5,355	6.4
Miscellaneous.....	69,632	86,851	D. 17,219	23.2
Total.....	\$2,166,746	\$2,377,817	D. \$211,071	9.0
Expenses.....	\$1,602,146	\$1,562,486	I. 39,660	2.5
Net earnings.....	\$564,600	\$815,331	D. \$250,731	31.1
Gross earn. per mile.....	4.107	4.090	D. .017	12.6
Net " " ".....	1.097	1.011	D. .086	33.9
Per cent. of exps.....	74.33	65.71	I. 8.62	...

The increase in expenses and decrease in gross earnings was due to increased prices of labor and materials, and to increase of through business from competing points with a loss of local freight traffic. In passenger traffic there was a loss in through but an increase in local traffic.

The result of the year was as follows:

Net earnings, as above.....	\$564,600.00
Balance from previous year.....	2,796.69
Total.....	\$567,396.69
Interest on first-mortgage bonds.....	\$420,000.00
" " Cairo Extension bonds.....	36,000.00
Total.....	\$456,000.00
Balance for debentures.....	\$108,925.38
Interest paid on first-preferred debentures, 2 per cent.....	106,000.00
Balance, June 30, 1882.....	\$2,925.38

The surplus over the first-mortgage and Cairo Extension interest was 1.26 per cent. on the whole amount of the debenture bonds. The interest on those bonds is not cumulative.

During the year 31.13 miles of steel rails and 288,774 new ties were put in the track.

The report says: "There is no floating debt beyond the current expenses of the month of June, which are liquidated on or before the 15th of the month next succeeding. The company has, however, guaranteed an advance of \$100,000 on account of the Cairo Extension over and above the amount realized from the sale of the bonds issued for its construction, but said amount is amply covered by securities specifically held in trust."

"The construction of this extension has cost somewhat more than was expected owing to the exceptionally bad weather through which the work was necessarily done and engineering difficulties which could not possibly be foreseen, resulting mainly from unusual floods in the Mississippi and Ohio rivers."

"It is purposed to maintain the standard of equipment as at present, to be added to from time to time, as additional equipment is fully paid for, by means of the car trust system."

"The present indebtedness on account of the equipment, thus far added by means of the car trust, is \$50,405.47, which, with the interest thereon, will be met by monthly payments of \$854.33, charged as paid in operating expenses. There will be added during the coming year eight locomotives, contracted for with the Baldwin Locomotive Works, at an aggregate cost, delivered, of \$100,000, to be paid for by 60 monthly payments of \$1,650 each, to be charged in like manner as paid in the operating expenses. * * * *"

"While the results of the past year's operations have been unsatisfactory, the causes therefor are simply explained by short crops and disastrous floods."

"Notwithstanding all these disadvantages, equalling in combined effect those of the memorable yellow fever year, the net revenue has largely exceeded the fixed charges, and we have reason, consequently, with increased facilities to enter hopefully upon the new and unburdened year."

Gulf, Colorado & Santa Fe.

At the close of the last fiscal year, July 31, 1882, this company operated a line from Galveston, Tex., to Lampasas 274 miles; the Ft. Worth Division, Temple to Ft. Worth, 128 miles; the Northeastern Division, Cleburne to Dallas, 53 miles; and the Eastern Branch, Navasota to Montgomery, 28 miles; a total of 483 miles. The Northeastern Division did not come into the possession of this company until July 31. There are under construction extensions of the Eastern Branch from Somerville to Navasota and from Montgomery to the International & Great Northern road, in all 72 miles; and the Houston Division, from Alvin to Houston, 23 miles.

The general balance sheet is as follows:

Stock.....	\$3,480,900
Bonds.....	5,505,000
Bills, accounts and balances.....	966,658
Income account, balance.....	191,223
Total.....	\$10,143,781
Road, etc.....	\$9,371,807
Fuel and materials.....	133,641
Bills, accounts and balances.....	392,461
Cash.....	45,872
Total.....	\$10,143,781

The bonds are all first mortgage bonds, bearing 7 per cent. interest, and are issued at the rate of \$12,000 per mile as the road is built.

The traffic for the year was as follows:

	1881-82.	1880-81.	Increase.	P. c.
Passengers carried.....	100,006	62,280	47,326	76.3
Passenger-miles.....	6,095,193	3,825,584	2,269,612	59.1
Tons freight carried.....	347,176	259,639	87,537	33.7
Ton-miles.....	30,961,051	26,320,442	13,640,609	51.8
Av. receipt.....	3.30 cts.	2.80 cts.	0.50 ct.	17.8
Per pass.-mile.....	2.50 "	2.50 "		

Last year there were 16,884 passenger-miles and 110,695 ton-miles per mile of road, against 18,043 passenger miles and 124,153 ton-miles per mile of road the previous year. The loss is caused by the great increase of road through a new country.

The earnings for the year were as follows:

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Freight.....	\$978,945	\$645,834	I. \$333,111	31.6
Passengers.....	201,289	105,587	I. 95,702	90.3
Miscellaneous.....	70,839	26,014	I. 44,825	177.4
Total.....	\$1,251,073	\$777,435	I. \$473,638	61.0
Expenses.....	\$10,936	\$23,684	I. 287,272	54.7
Net earnings.....	\$440,117	\$253,751	I. \$186,366	73.4
Gross earn. p. mile.....	3.463	3.607	D. .144	5.6
Net " " ".....	1.218	1.197	I. .021	1.8
Per cent. of exps.....	64.8	67.4	D. 2.6	...

The gross earnings did not increase quite so fast as the mileage, partly owing to extensions into new country, and partly to failure of crops from drought, as stated below.

The income account was as follows:

Net earnings, as above.....	\$440,117
Interest.....	\$291,900
Rentals.....	13,458
Miscellaneous.....	26,026
Balance, surplus for the year.....	\$108,733

The report refers to the last fiscal year as follows: "Owing to the continued drouth, the wheat, corn and oat crops yielded no surplus for transportation, and the cotton crop for the whole state, as estimated for the year ending Aug. 31, 1882, was 878,854 bales, as against the year ending Aug. 31, 1881, 1,260,247 bales. The total number of bales reaching Galveston for the year ending Aug. 31, 1882, was 442,860 bales, as against the year ending Aug. 31, 1881, 694,661 bales. The total receipts over our road for the year ending July 31, 1882, was 184,037 bales, as against July 31, 1881, 288,187 bales."

The President's report says: "The state of Texas owes us about 400,000 acres of land, and we have about 20,000 acres of land along our line of road, together with town sites at all stations, which belong to your company, and which are worth at least \$150,000 more than we have paid for them. * * * *"

"At the time this report is being written, the grading on the Eastern Branch from Somerville to Navasota is about completed (30 miles). The iron bridge to cross the Brazos River is en route, and the road to Navasota may be completed by Dec. 1. A large force is engaged in grading the Houston Branch, and with favorable weather Houston will be reached by the middle of November. We have all the iron, fastenings, ties and other materials on hand and paid for to complete all the road we have under construction."

"The directors also determined to purchase the Chicago, Texas & Mexican Central Railway, extending from Cleburne to Dallas, a distance of 53 miles. The transaction was closed in the last days of July, but the entries do not appear in the books of the company until August. The cost of the road does not, therefore, appear in the present statement. Possession of the road was taken Aug. 1, 1882."

"As there is a very large business centering in Houston, the directors determined to build a branch road to that point from Alvin, on the main line, a distance from Houston of about 23 miles. This will give a line from Galveston to Houston of about 51 miles."

"We will also receive an increase of business from the connection made with the Texas & St. Louis Railway at McGregor. This road extends through one of the richest portions of the state, and we have made arrangements with its management to exchange business on a mutual satisfactory basis. The New York, Texas & Mexican Railway, connecting with us at Rosenberg, was opened for business to Victoria on July 15, 1882, and this will also give us increased business. * * * *"

"On Aug. 1, 1881, 245 miles were operated, of which 19 were leased, and on Aug. 1, 1882, 430 miles were operated, all owned by the company, the leased road from Arcola to Houston having been dropped March 15, 1882."